Beautiful Woods

frank paxton lumber co.

(ONE DOLLAR FIFTY CENTS PER COPY)

PAXTON

January 1950

To Our Friends:

Wood and its numerous products combined create one of our nation's largest industries and occupy an important place in our American way of living.

The purpose of this handbook is to make available in one source a collection of data on the subjects of wood and lumber intended to be of interest and helpful to those in the woodworking industry. Our indebtedness to sources of information is here gratefully acknowledged.

Since 1914 our company has had the pleasure of serving the woodworking industry and other industries using lumber. During this time, in our effort to be the finest, you have made our firm the largest of its kind in the field.

Your faith in our integrity and in the quality of our products is deeply appreciated.

Sincerely yours,

Frank Paxton

(1887-1951)

Since 1961 Frank Paxton Company stock has been publicly traded in over-the-counter markets. Dividends are paid quarterly. Latest annual report will be mailed upon request. This is the fourth edition of "Beautiful Woods." More than 60,000 copies have been distributed.

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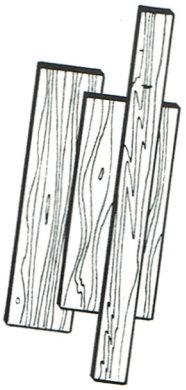
COMMON LUMBER TERMS and Abbreviations

Air-drying. (AD) Method of drying lumber by permitting air to circulate around the lumber through spaces provided when it is piled.
Band Sawn. Saw blade tooth markings (on face) are at right angle to edge of board.
Board Foot. A piece of lumber 1 in. thick, 12 in. wide, and 1 ft. long, or its equivalent.
Burls (or burrs). Abnormal warty growth on trunk of tree. Highly figured and nearly always marketed as decorative veneers.
Check. A lengthwise separation of the wood.
Circular Sawn. Saw blade tooth markings are curved on face of board.
Collapse. A seasoning defect resulting in the breakdown of wood cells, caused by too hasty or improper seasoning.
Color Change. With few exceptions (walnut, etc.) most woods darken after finishing if not constantly exposed to sun's rays.
Decay. Disintegration of wood substance due to the action of wood-destroying fungi.
Dimension Lumber. Lumber cut to predetermined specific width (sometimes to length also). Examples: 1" x 4", 2" x 6", 4" x 4", 2" x 4" - 8', etc.
End Check. The separation of the wood fibers at the end of a board.
Growth Rings. New wood formed by the annual growth of a tree. (Also called annual rings.)
Hardwood. The wood of any broad-leaved tree bearing its seeds in a closed cavity. This term does not relate to the density of the wood.
Heartwood. The central part of the trunk of a tree, consisting of matured wood in which practically no further change will occur.
Honeycomb. A defect of lumber in which wood is eaten away by insects, giving it the appearance of honeycomb. This term also loosely used to describe internal, open checking, usually in 1-1/2" and thicker lumber, caused by improper kiln drying.
Kerf. The path that any saw makes in the process of cutting.
Kiln-drying. Artificial method of drying lumber by forcing heated air to circulate around the lumber. (Abbreviated KD).
Knot. A portion of a branch of a tree that forms a mass of woody fiber running at an angle to the grain of the main stock and making a hard place in the timber.
Linear Foot. A piece of board one foot in length, regardless of width or thickness.
Logging. The process of cutting trees and moving the logs to the sawmill.
Medullary Rays. The cellular tissue in wood, extending from the pith, or heart, to the bark.
Pith. The small soft core occurring in the structural center of a log.
Plain (Flat) Sawing. See Lumber Growth & Manufacture Section in this book.
Porous. This term refers to hardwoods only, as all softwoods are non-porous. Woods are commonly referred to as "ring porous" or "diffuse porous." Many trees grow faster in the spring than in the summer. "Spring wood" is softer and coarser than "summer wood;" the annual growth in such trees is easily apparent on cross section, and is displayed as a prominent pattern on tangential section. "Diffuse porous" simply means that growth is uniform throughout the growing season. The mahoganies are "diffuse porous" woods, the oaks are "ring porous."
Pulp. Wood fibers, ground and suspended in water, from which paper is made.
Quartersawing. See Lumber Growth & Manufacture Section in this book.
R.W.&L. Random widths and lengths.
Resin. A vegetable liquid or semi-liquid which exudes from certain species of trees, particularly the pine tree. Pine resin is the source of naval stores.
RGH. Rough, i.e., as the board comes from the saw, not surfaced.
Rift Sawing. See Lumber Growth & Manufacture Section in this book.
S2S. Surfaced on two sides; edges rough.
S4S. Surfaced all four sides.
SND. Sap no defect.
Sapwood. The outer part of the trunk of the tree through which the sap flows most freely.
Second-growth Timber. The forest growth which follows either partial or total cutting of the original forest.
Seed Tree. A tree which is spared during the lumbering process for the purpose of providing a source of seed for restocking the cut-over area.
Selective Cutting. Practice of cutting only mature trees for lumber.
Shake. A lengthwise separation of the wood, the greater part of which occurs between the growth rings. Shakes are differentiated from checks by the fact that they occur in the timber before it is cut into lumber, usually resulting from violent storms or in felling the log.
Shrinkage. Greatest in hardest woods. Plain sawn boards will usually shrink twice as much as quarter sawn.
Softwood. The wood of any cone-bearing tree, regardless of whether the wood is in fact hard or soft.
Split. A lengthwise break in a board.
Square Foot. A piece of board one foot square, or its equivalent, regardless of thickness.
Stain. Discoloration in lumber. A substance for coloring wood.
Steamed. This term, when applied to Walnut lumber, refers to a special process in which the green lumber is steamed in vats for the purpose of darkening the sapwood.
Surface Check. The separation of the wood fibers, producing small checks or cracks on the surface of a board.
T&G. Tongued and grooved on sides of board; otherwise D&M, i.e., dressed and matched.
T&G&EM. Tongued and grooved and end matched, i.e., tongued and grooved on all four edges of piece, as in Oak Flooring.
Veneers. Sliced or peeled thin sheets of wood for gluing to other veneers or to some other base material. Most hardwood veneers are used for decorative purposes.
Wane. The presence of bark, or the lack of wood from any cause on the edge or corner of a piece of lumber.
Warp. To turn or twist out of shape. Especially prevalent in woods of uneven density, e.g., sapwood and heartwood of contrasting hard-soft annual growth. Also results from applying finishes, veneers, laminated plastics, etc., to one side of the piece only.
W.H.N.D.&W.H.A.D. Worm hole no defect and Worm hole a defect.

RANDOM WIDTHS AND LENGTHS (R W & L)



To one not working regularly in fine woods, the fact that hardwoods are almost always offered in a random width and length assortment presents something of a mystery. One is inclined to wonder, "Why aren't birch, oak and walnut produced in convenient sizes like pine, redwood and fir?"

The answer: markets for hardwoods and softwoods are entirely different. Softwoods are used mainly for construction, while most hardwoods go into furniture, fixtures and mouldings.

Hardwood lumber is cut to yield the maximum of usable material. Each board is sawn as wide and long as the log allows, then trimmed just enough to make the edges and ends square.

This production method satisfies the major hardwood markets; at the same time limiting waste and reducing costs.

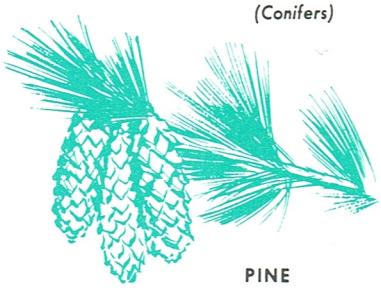
Both widths and lengths are, of necessity, random, and even the best grades allow an occasional defect. No other manufacturing system could fully exploit hardwood timber, keeping the cost of these fine woods within the reach of all.

LUMBER GROWTH and MANUFACTURE

LUMBER IS OBTAINED FROM TWO GROUPS OF TREES

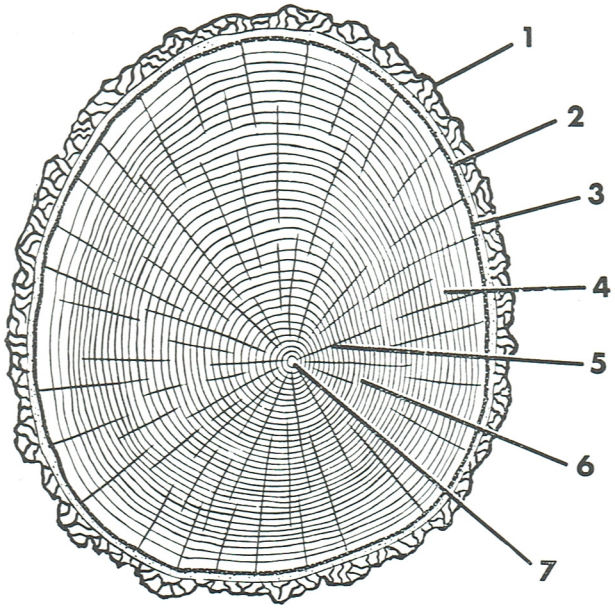
HARD WOOD
(Broad-Leaved)

MAPLE



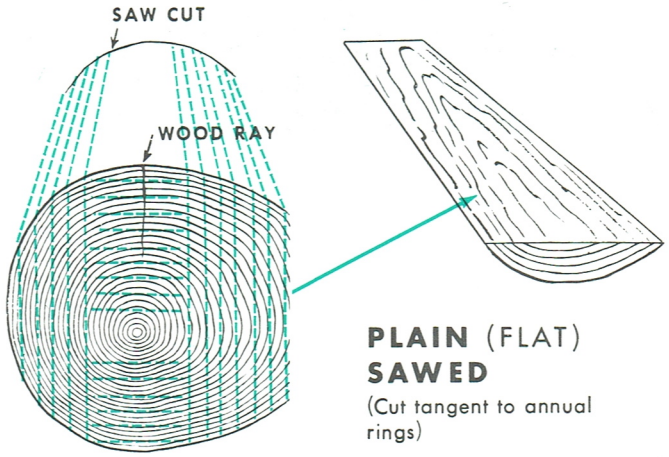
SOFT WOOD
(Conifers)

PINE

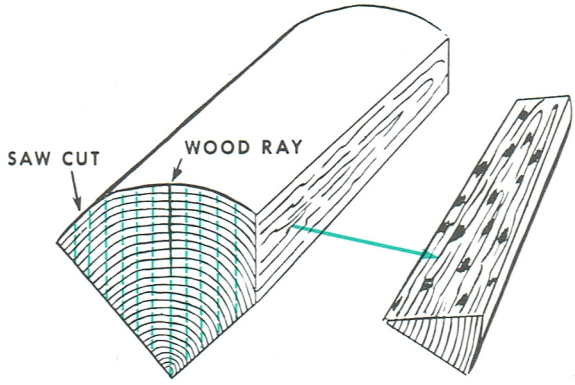


TREE TRUNK

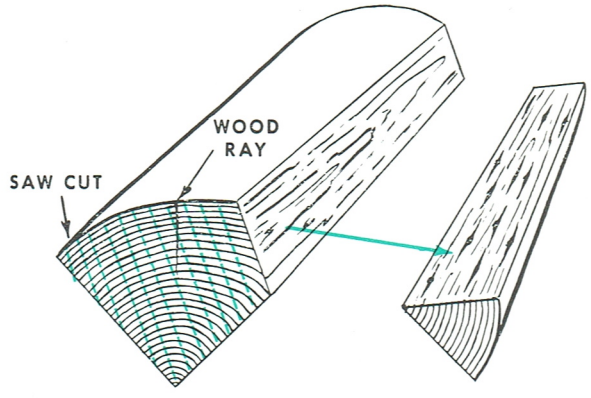
1. Outer bark *(dead tissue)*
2. Inner bark *(carries food)*
3. Cambium *(growing tissue)*
4. Sap Wood *(light color)*
5. Wood Ray *(food storage)*
6. Heartwood *(dark color)*
7. Pith



PLAIN (FLAT) **SAWED**
(Cut tangent to annual rings)



QUARTER SAWED
(Showing figure)



RIFT SAWED
(Showing a pencil line grain)

NOTES

A. Most Lumber Is Plain Sawed.
B. Advantages in Plain Sawing:
   1. Less costly and wasteful, hence more available.
   2. Easier to kiln dry.
   3. Averages wider widths.
C. Advantages in Quarter Sawing:
   1. Shrinks, twists and cups less.
   2. Checks and splits less.
D. Advantages in Rift Sawing:
   1. Rift sawing is midway between quarter sawing and plain sawing. It offers the same advantages as quarter sawing, but is usually done only for the special decorative effect.

THE FINISHING OF WOOD

Wood is the most versatile of all the materials man uses to shape his environment to his needs. The tree, in some parts of the world, provides all three necessities of life . . . food, clothing and shelter.

When we move a step beyond sheer utility, into a realm where esthetic values matter, such useful articles as chairs, tables and beds must have something more than a practical value . . . we want them to *look* good, to be a delight to our senses while performing their prosaic functions.

Nobody knows who first discovered that the natural beauty of wood can be enhanced by the addition of what are, in a real sense, cosmetics. But there it is . . . with few exceptions, woods are genuinely better looking when skillfully and tastefully finished. To the human eye, a uniform color, harmonizing with a planned decorative scheme, is more pleasing than the random color variations provided by nature, and a polished surface is more pleasing to the touch than a rough one. Such materials as lacquers, varnishes and pentrating oils add to wood a vibrant translucency that, like the seven veils of Salome, obscures only to reveal more alluringly the beauty that lies beneath.

There is no sensible answer to the question, "What is the best finish?" There is no "best" finish, just as there is no "best" color. That which is most pleasing to the user is best for him. Almost any modern finish, if applied with care, satisfies both practical needs and the desire to own beautiful things.

By far the most common error of the beginner is the idea that the finish he uses will disguise or minimize flaws in the bare surface. Precisely the opposite is true. No finish hides blemishes. In fact, the finish tends to emphasize flaws in the surface to be finished.

As a general rule, the beginner has a better chance of first success using one of the penetrating oils (danish oil), especially when the wood is to be left in its natural color, because good results here depend more on conscientious effort than upon seasoned skill. Not only that, a high quality danish oil finish lacks nothing in handsome appearance and rugged durability.

Thus we see that the right finish is a matter of individual choice. For him who wants his project's surface to have the flawless sheen of a Steinway, a multi-step film finish is undoubtedly best. For good looks and durability combined with relative ease of application, the penetrating oil (danish oil) finish may be best. Additionally, there are scores of special finishes for special situations, most of which are perfectly satisfactory when chosen with care for a planned purpose.

Our only comment when we're asked to take sides: "The way to achieve a professional-looking finish is to work on the surfaces to be finished until they're as free from scratches, torn grain, gouges and other imperfections as you're able to make them. Once you've done that you can't miss with whatever finish you think is best for you!"

On a light note, we might close with the favorite jest of the people who manufacture finishes: "After all else has failed, read the instructions." And oh, yes . . . don't forget always to seal both sides of anything you're finishing; helps avoid an unbalanced condition that may result in future cupping or warping.

COMPARATIVE ADHESIVES CHART

PRINCIPAL CHARACTERISTICS OF GLUES MOST USED BY WOODWORKERS

In wood gluing, moisture content of the lumber, relative humidity of the atmosphere and temperature of both glue room and lumber all influence results. The information shown below relates to average conditions.

Some woods are much easier to glue than others, e.g., basswood is very easy, teak very difficult.

White liquid glue (polyvinyl resin) is convenient, always ready, easy to use, indefinite bench life, no wastage, self-bonding, average 30-minute clamp time, no staining, ample strength . . . an outstanding performer for interior use. **Paxton's Paxbond** is best of this type; rates tops in both shear and pull-apart tests.

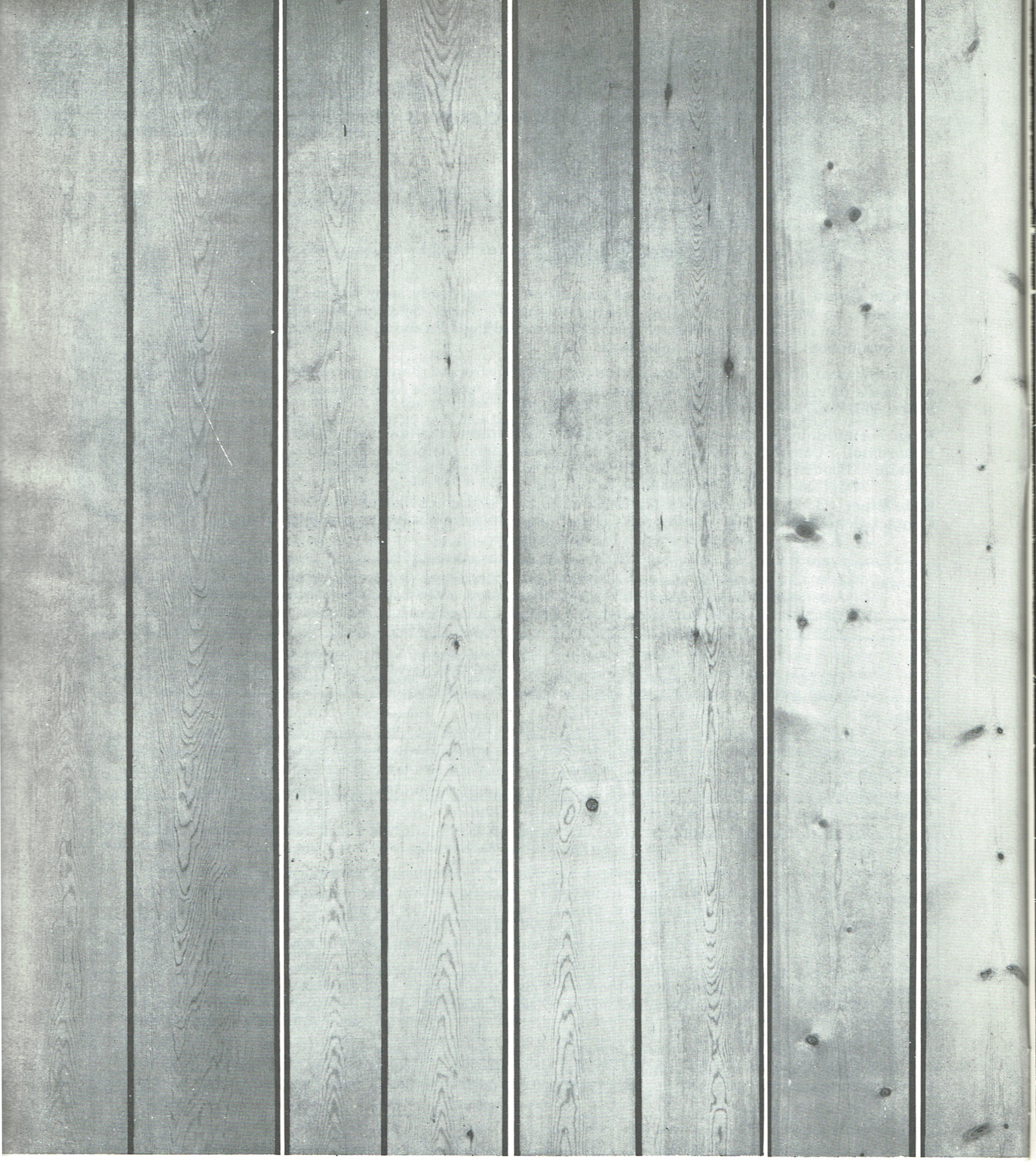
Higher-priced **aliphatic resin liquid glue** tests slightly stronger than polyvinyl resin, but a well made polyvinyl resin joint is stronger than the wood. Aliphatic resin squeeze-out sands better; some woodworkers regard that as an advantage.

Urea Formaldehyde: Used mostly in production gluing where glue line is set by heat.
Resorcinol: Completely waterproof and fungus proof. Stands boiling water. Stains.
Casein: Popular in rough construction and other outside projects. Inexpensive, and sets at temperatures down to freezing.
Hide Glue: Good, but no better than liquid white glue, and much harder to use.
Contact Cements: Most woodworkers use at least occasionally for special jobs, gluing laminated plastics to panel base, etc.

Gluing tips: Matching adjoining boards for similar grain will enhance project's appearance and improve stability. Carefully following instructions of the glue manufacturer helps assure permanently successful glue joints.

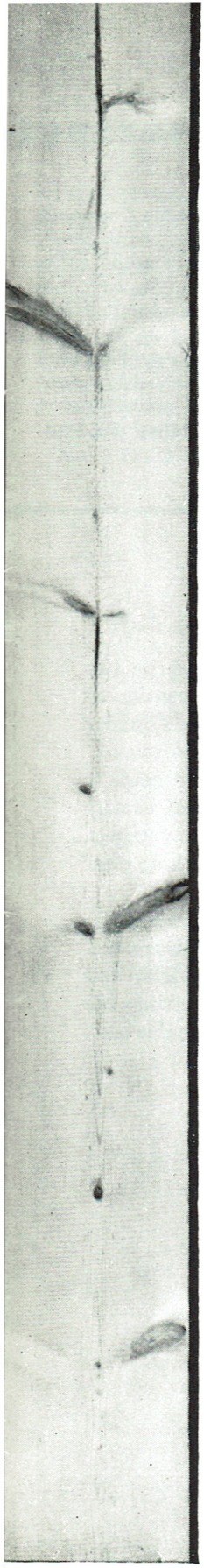
QUESTIONS	Liquid Polyvinyl (Paxbond)	"Titebond"	Dry Powder Urea Formaldehyde Resin	Dry Powder Resorcinol	Standard High Grade Casein	Top Grade Animal Hide Glue	Contact Cements
Base material	Polyvinyl acetate	Aliphatic resins	Urea formaldehyde	Resorcinol resin	Casein (milk)	Hides, hoofs, horns	Neoprene
Moisture resistance (cold water)	Medium	Medium	Excellent	Waterproof	Very high	Low	Very high
Heat resistance	Adequate	Good	Unaffected	Unaffected	Good	Good	Fair
Solvent resistance	Fair	Good	Unaffected	Unaffected	Unaffected	Unaffected	Poor
Clamp time	30 min.	30 min.	2 to 8 hrs.	Several hours	3 to 6 hrs.	30 min.	No Clamping
Pressure required	Low	Low	150 lbs. per sq. in.	Heavy	Low	Low	Momentary
Maximum assembly time	5 min. open 10 min. closed	5 min. open 10 min. closed	15 to 20 min.	10 to 15 min.	15 to 20 min.	1 1/2 min.	1-2 hrs.
Room temperature	60°-110° F	60°-110° F	70° or higher	70° or higher	33° or higher	Lumber must be warm	60° or higher
Thermal setting?	No	No	Yes	Yes	No	No	No
Abrasive to cutting tools?	No	No	Yes	Yes	Mild	No	No
Does it stain?	No	No	No	Yes	Mild	No	No
Self bonding?*	Yes	Yes	No	No	Yes	Yes	Yes
Suitable for edge gluing?	Yes	Yes	Yes	Yes	Yes	Yes	No
Suitable for joint gluing?	Yes	Yes	Fair	Fair	Yes	Yes	No
Bench life?	Indefinite	Indefinite	3 to 4 hrs.	1 to 2 hrs.	8 to 10 hrs.	Daily mix	Indefinite
Shelf storage life?	6 mo. plus 60°-90° F.	6 mo. plus 60°-90° F.	1 yr.	1 yr.	1 yr.	1 yr.	6 mo. plus 60°-90° F.
Bond imperfect joint?	Yes	Yes	No	No	Yes	Yes	No
Recommended for face veneering?	No	No	Yes	No	No	No	Yes
Gluing plastics to plywood?	Yes	Yes	Press work only	No	Yes	No	Yes
Mixing time	None	None	One min.	One min.	20 min.	30-45 min.	None

*Self bonding definition: satisfactory joints possible without clamp pressure. Except for contact cements, however, all glue joints will be better if clamped for clamp times shown.



1 2 3 4 5 6 7 8

B & Better Select C Select D Select No. 1 Common No. 2 Common



9

No. 3 Common

GRADING OF WESTERN PINES

Courtesy of Western Wood Products Association
1500 Yeon Bldg., Portland, Oregon 97204

SELECT GRADES

B & Better Select (1 & 2 Clear)

B & Better is the highest recognized grade of Pine — a practically perfect grade.

Although graded from the better side, even the backs of pieces in B & Btr. are of extremely high quality. To all practical purposes, the grade is clear.

B & Btr. Ponderosa Pine is used for finishing work of the very highest order, including interior trim, siding, paneling and cabinet work. It is also used for special industrial purposes where practically clear lumber in fairly large pieces is desired.

C Select

C Select is the second grade of Pine finish lumber and is designed to provide a top grade paint finish wood. Many pieces have a B & Btr. face with backs of a slightly lower quality than are permitted in the higher grade. Other pieces have a clear appearance but contain small spots of slightly torn grain, fine checks or possibly light pitch.

C Select is suitable for the very highest uses where entirely clear lumber is not required.

D Select

D Select includes pieces showing a finish appearance on one side only, the back of the board at times containing knots, pitch, wane or a combination thereof. In such cases, the face is correspondingly high. A type often used is a high line piece requiring a cut to eliminate a defect too serious to go into finish work.

It is an especially useful grade for the small planing mill and works up into various articles of woodwork with little waste.

Moulding Grade

This is a special grade exhibiting characteristics of both Select and Factory grades. As the name suggests, a high yield in long, clear but ***narrow*** cuttings suitable for producing mouldings is the basis of the grade.

Price of Moulding Grade is intermediate between D Select and Third Clear, and the board will normally be found to be too good for Third Clear and not good enough for D Select. It is a sound value for the custom woodworker, because he can produce almost anything he needs from it at relatively reasonable cost. *(Not illustrated)*

COMMON GRADES

Number 1 Common

Number 1 is the highest of five grades into which Pine Common is classified and contains pieces of the small knot variety. Knots are always sound, red or intergrown, smooth and are limited in size to slightly more than 2″ in diameter, depending upon the size of the piece. As a rule, the knots average very much smaller and are well distributed along the board.

Only pieces that show smooth dressing around knots are allowed in No. 1 Common. Knots in No. 1 Common are usually round or oval in shape and seldom occur on the edges of the board.

Number 2 Common

Number 2 Common, a very popular grade, represents a large percentage of the total production of Ponderosa Pine lumber. An all-around utility grade, it is suitable for all uses where a good grade of Common is required. It contains the same type of defects as No. 1, but in greater degree.

Generally similar to No. 1 in appearance, No. 2 allows larger and more pronounced characteristics. In narrow widths, knots are usually limited to 2½″ in diameter, and in wider widths to 3½″, but the average is considerably less than the maximum.

Number 3 Common

Number 3 comprises pieces of less uniform appearance than those in the two higher Common grades, varying from a piece of otherwise No. 1 or No. 2 quality with a single characteristic which causes it to Grade No. 3, down to pieces showing numerous coarse knots, or boards with loose knots or an occasional knot hole. A piece containing a knot hole is generally of otherwise high quality.

A limited amount of heart shake and pitch may be found in low line pieces of No. 3, provided they do not occur in serious combination with other defects. A type frequently found is a piece with a No. 2 face, but showing several skips in dressing.

The detail and illustrations under this heading are technically applicable only to Ponderosa Pine, but the theory of all Pine grades is the same. Differences in grading rules governing the several Pine species are generally of a minor nature, and are occasioned primarily by differences in the type of timber produced by the individual species. Pictures are shown through the courtesy of Western Wood Products Association.

EXAMPLES

No. 1 1x12″–10′ Face entirely clear.

No. 2 1x12″–10′ Very light trace of pitch at one end for 5 inches.

No. 3 1x8″–10′ **Face**—Three small dry pitch pockets, otherwise perfect.
Back—One ¾″ black knot. One ½″ hole in center where blind knot has sloughed out.

No. 4 1x10″–10′ **Face**—One ½″ tight black knot at one end, and near center is a medium pitch spot ¼″ x 1″, also one small pitch pocket.
Back—Clear with the exception of one dog mark on edge near one end.

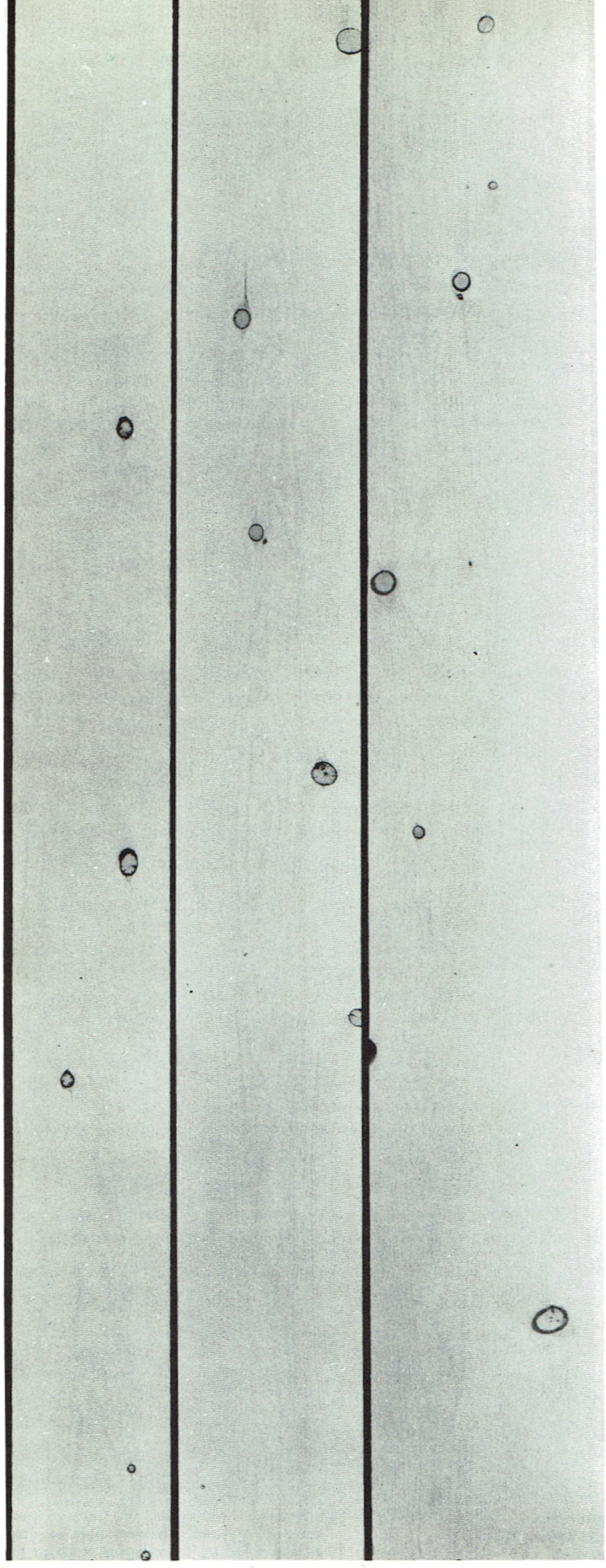
No. 5 1x10″–10′ **Face**—One 1″ loose black knot. (This is a typical cutting D.)
Back—The loose knot is same size, in addition has one pitch pocket ⅛″ x 1″ and a 3″ skip in dressing.

No. 6 1x10″–10′ **Face**—Two small pin knots, one dry pitch pocket 1/16″ x 1¼″, two very small streaks of medium pitch and one firmly set black knot ¾″ in diameter.
Back—Five black knots ¼″ to ¾″ in size, two streaks of medium pitch ½″ wide and 6″ long, also one ¾″ knot sloughed out on edge.

No. 7 1x12″–10′ A dozen small red knots, and four red knots from 1″ to 1½″ in size, also a small streak of light pitch running out from one of the knots.

No. 8 1x10″–10′ Very smooth in appearance with fifteen red knots 1½″ and less in size, a small amount of heart pith and medium pitch scattered over the face for three feet at one end.

No. 9 1x12″–10′ Three feet of firm heart pith, a dozen small red knots, and three branch knots 5″ long, running out to the edge.



1 2 3

Inch 3rd. Clear (Factory Select)

INCH FACTORY

Factory grades are determined by percentages of clear cuttings of required sizes obtainable from each piece. Appearance of the board is not considered; pieces may have knot holes, large knots, wane, splits or other imperfections which can be eliminated in calculating the yield necessary to make the grade.

The two Inch Factory Grades, Third Clear and No. 1 Shop, are differentiated by their yield in clear cuttings of the prescribed sizes. Following are minimum cutting sizes used in determining percentage of yield:

Inch Third Clear (Factory Select)

Inch 3rd. Clear comprises the higher of the two grades of 4/4 Factory lumber and must contain at least 70 per cent of cuttings of the sizes and quality specified.

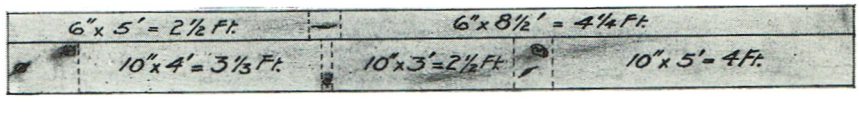
While the minimum requirement of the grade is 70 per cent of cuttings, the bulk of the stock usually contains a higher proportion of high grade cuttings. The principal feature is the large yield of long clear or nearly clear cuttings.

Inch 3rd. Clear is especially suited for the requirements of cabinet shops, frame and woodwork factories, wood specialty plants and industrial arts shops because of the proportion of long cuttings obtainable with a minimum of waste at reasonable cost.

Examples of Inch 3rd. Clear (Factory Select)

No. 1. 4/4x12″-10′	1 cut 12″x31″.	
	1 cut 12″x29″.	
	1 cut 6″x40″.	
	1 cut 6″x38″.	
No. 2. 4/4x14″-10′	1 cut 12″x18″	One end.
	1 cut 7″x38″	One edge.
	1 cut 7″x42″	
	1 cut 7″x79″	Opposite edge.
No. 3. 4/4x18″-10′	1 cut 6″x42″	One edge.
	1 cut 5″x57″	
	1 cut 12″x20″	Opposite edge.
	1 cut 12″x61″	
	1 cut 8″x36″	

Inch 3rd. Clear (Factory Select)—This piece is 16 inches in width and 14 feet in length, and scales 18⅔ board feet. It contains 16.6 feet of cuttings, or 88.8% .



GRADES

(1) 9½″ wide or wider by 18″ long or longer and (2) 5″ wide or wider by 3′ long or longer in Third Clear; 4″ wide or wider by 3′ long or longer in No. 1 Shop. Any sizes obtainable over these minimums are figured in securing the necessary percentages. Pieces 9½″ wide or wider and less than 3′ long are free from defects on both sides. Pieces 5″ wide and wider in Third Clear (4″ and wider in No. 1 Shop) and more than 3′ long are graded as C Select or better. Inch Factory lumber is shipped in random lengths 6′ and longer; Third Clear in random widths 5″ and wider, No. 1 Shop in random widths 4″ and wider.

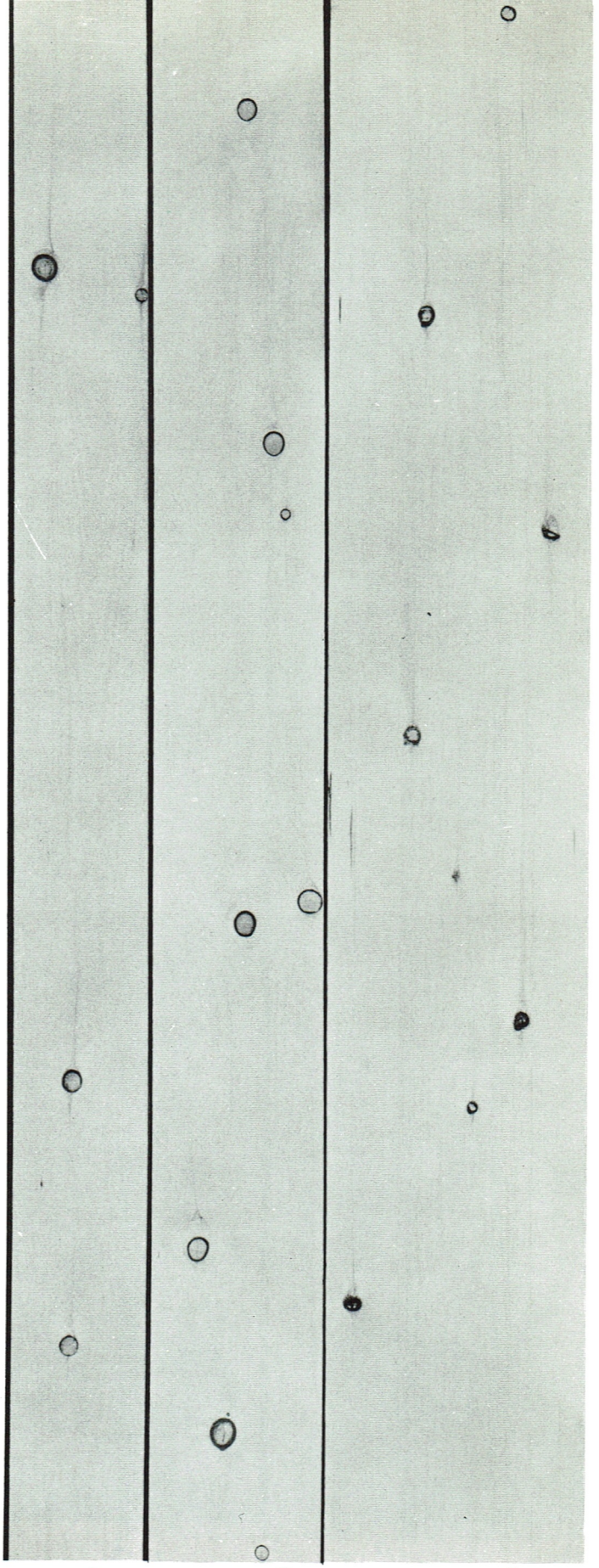
Inch Number 1 Shop

Inch No. 1 Shop, second of two grades in its classification, contains 50 to 70 per cent of cuttings suitable for general woodwork.

It is used for the same purposes as Inch 3rd. Clear.

Examples of Inch No. 1 Shop

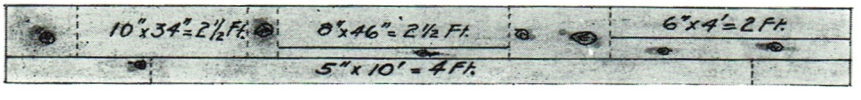
No. 1. 4/4x10″-10′	1 cut 10″x57″ Clear both sides.
	1 cut 6″x36″ Clear both sides.
No. 2. 4/4x12″-10′	1 cut 13″x22″ Clear both sides.
	1 cut 13″x24″
	1 cut 13″x18″
No. 3. 4/4x20″-10′	1 cut 8″x42″ Clear both sides.
	1 cut 9″x53″ Clear both sides.
	1 cut 10″x20″ Clear both sides.
	1 cut 10″x28″ Clear both sides.
	1 cut 10″x36″ Trace of light pitch streak.
	1 cut 10″x24″ Clear both sides.

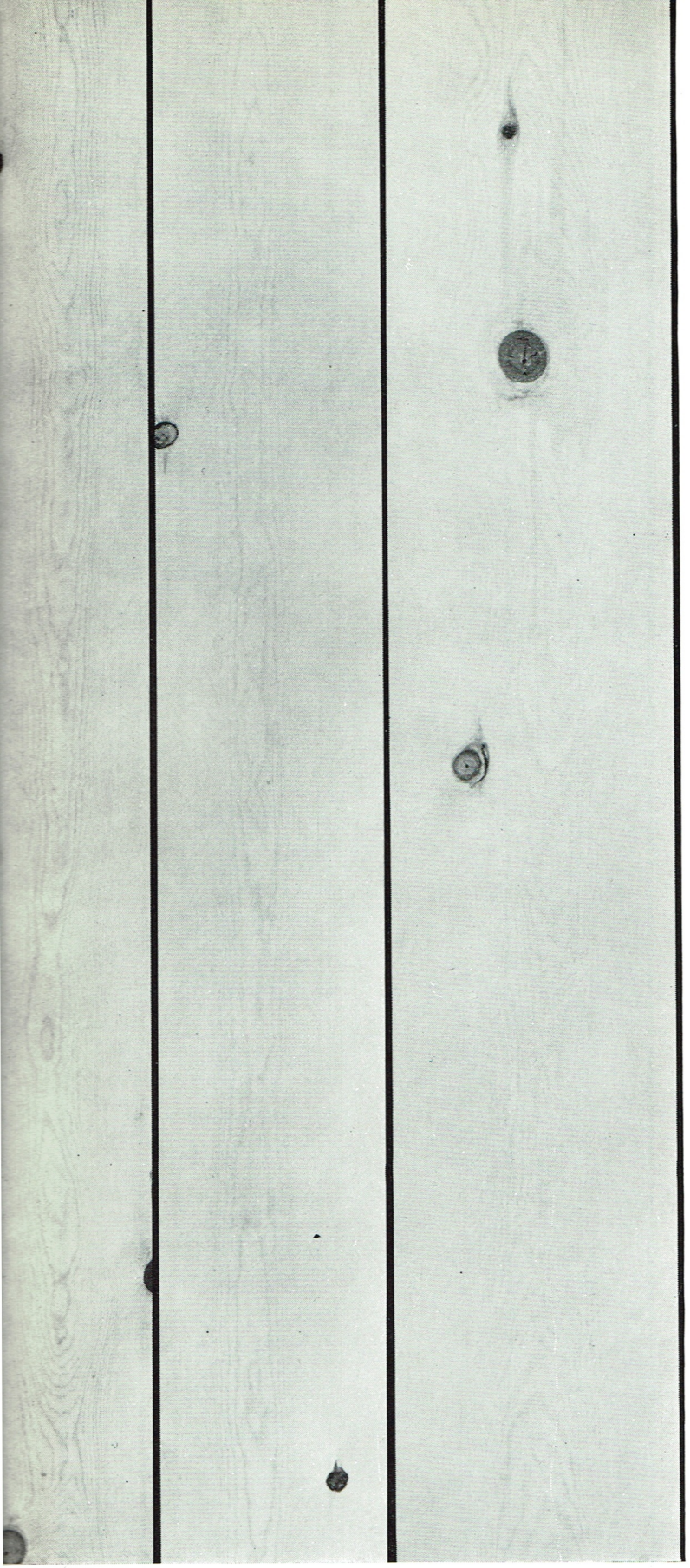


1 2 3

Inch No. 1 Shop

Inch No. 1 Shop—The sample below is 15 inches wide by 14 feet long. It scales 17½ board feet, and contains 10.8 feet of cuttings, or 61.9%.





1 2 3

5/4 and Thicker 3rd. Clear (Factory Select)

5/4 AND THICKER

Factory grades are determined by percentages of clear cuttings of required sizes obtainable from each piece. Appearance of the board is not considered; pieces may have knot holes, large knots, wane, splits or other imperfections which can be eliminated in calculating the yield necessary to make the grade.

Factory lumber 5/4 and thicker is sorted into four grades — 3rd. Clear, No. 1 Shop, No. 2 Shop and No. 3 Shop — according to the percentage of cuttings which can be obtained from each piece. All grades are made in 5/4 ($1\frac{1}{4}$″), 6/4 ($1\frac{1}{2}$″), 7/4 ($1\frac{3}{4}$″) and 8/4 (2″), with 10/4 ($2\frac{1}{2}$″) and thicker available from some mills. Widths run 5″ and wider and lengths from 6′ in multiples of 1′ or 2′.

3rd. Clear (Factory Select) (5/4 and Thicker)

3rd. Clear is the highest grade of Factory lumber and is intended for use by sash and door factories and other architectural woodwork concerns.

Not over two muntins are admissible in any one piece and no piece is included in the grade if it contains muntins only. The grade is determined from the poor side of the piece. 3rd. Clear contains 70 per cent or more of No. 1 cuttings, except one No. 2 door stile is permitted in pieces containing one No. 1 stile or two or more No. 1 door cuttings.

3rd. Clear is highly recommended for its cutting qualities and is well suited for manufacture into a wide variety of woodwork articles as well as for manufacture into doors. It is worked into mouldings and trim with practically no waste. It furnishes a large percentage of door stiles.

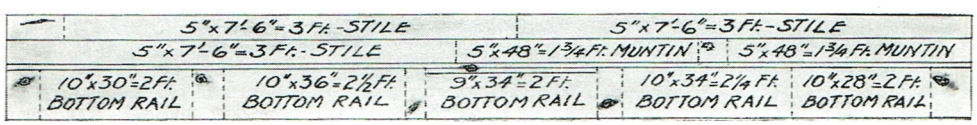
Examples of 5/4 and Thicker 3rd. Clear (Factory Select)

No. 1 6/4x11″–10′ One No. 1 Stile 6″ wide, 7′ long. One Bottom Rail 9″ wide, 2′-4″ long. Also one No. 1 Muntin 5″ wide, 4′ long.

No. 2 6/4x16″–10′ One No. 1 Bottom Rail 10″ wide, 3′ long. Two No. 1 Stiles 5″ wide, 6′-8″ long and one No. 1 Stile 6″ wide, 7′-6″ long.

No. 3 6/4x20″–10′ One No. 1 Stile 6″ wide, 7′-6″ long and one No. 1 Stile 5″ wide, 7′-2″ long. Two No. 1 Bottom Rails 9″ wide, 2′-4″ long. Also one No. 1 Muntin 6″ wide, 4′ long.

5/4 & Thicker 3rd. Clear—This piece is 21 inches wide by 16 feet long, and scales 28 feet surface measure. It contains 83.2% of cuttings.



FACTORY GRADES

Cuttings in 5/4 and thicker Factory lumber are stiles, muntins, bottom rails, top rails and sash stock. Sizes are: stiles—5″ and 6″ wide, from 6′8″ to 7′6″ long; muntins—5″ and 6″ wide, from 3′6″ to 4′ long; top rails—5″ and 6″ wide, from 2′4″ to 3′ long; bottom rails—9″ and 10″ wide from 2′4″ to 3′ long; sash cuts —2½″ and over in width by 2′4″ and over in length.

Two grades of cutting are recognized: No. 1 cuttings are free from defects on both sides except for one barely perceptible bark pocket or pitch blemish; No. 2 cuttings permit minor imperfections which do not detract from the use intended.

Number 1 Shop (5/4 and Thicker)

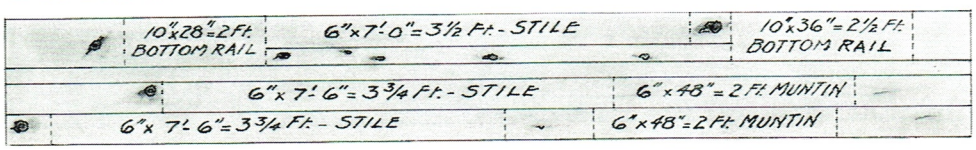
Number 1 Shop is the second highest cutting grade intended for factory use. Requirements are that each piece contain from 50 to 70 per cent of door cuttings all of No. 1 quality except for one No. 2 stile.

No. 1 Shop lumber in Pine is a widely recognized standard at millwork plants for re-manufacturing purposes. Its chief characteristics are freedom from warp and twist. Well scattered knots increase the number of long clear cuts, so desirable in the factory.

Examples of No. 1 Shop

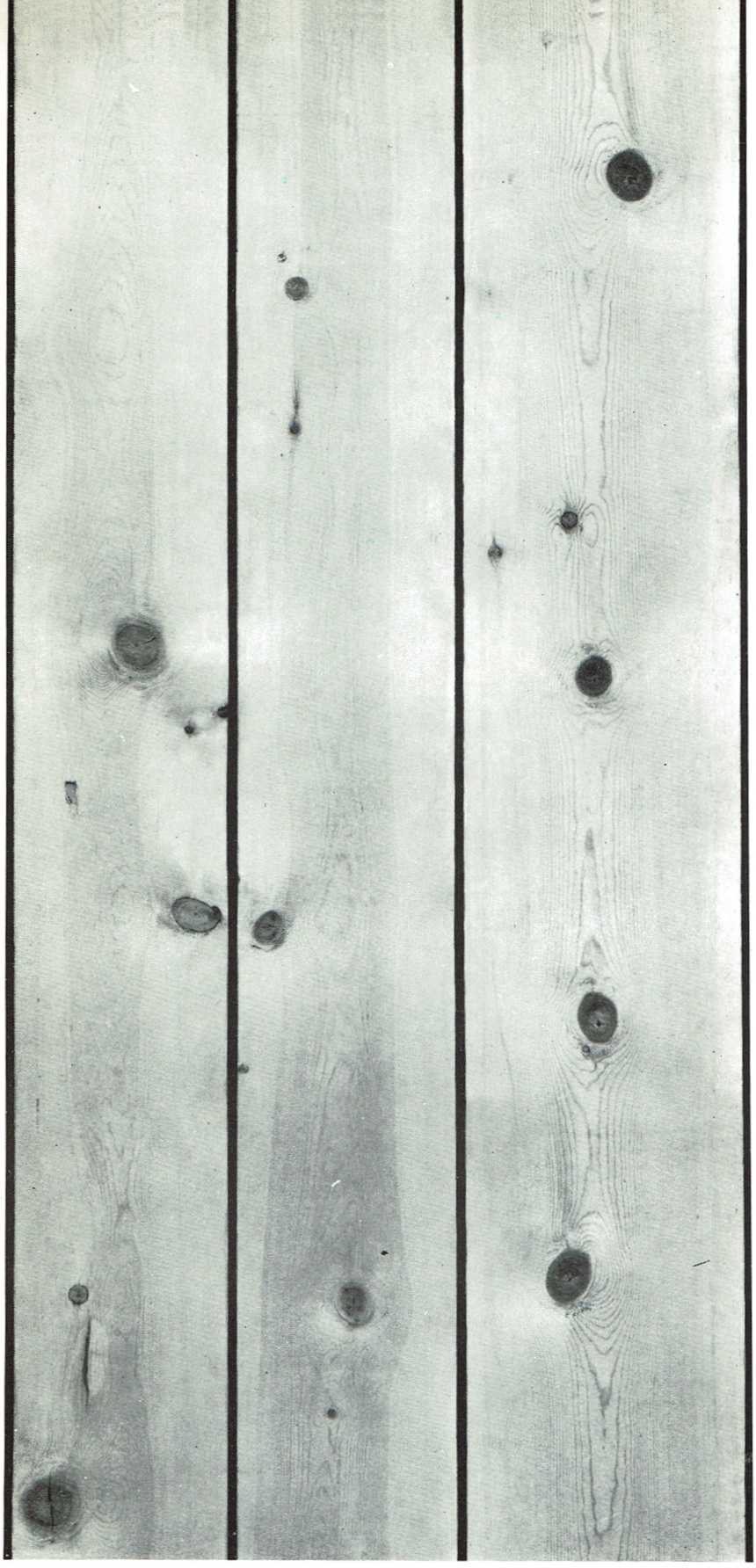
No. 1 5/4x10″-10′	Two No. 1 10″ Rails. One is 28″ and the other 32″ long.
No. 2. 5/4x10″-10′	One No. 1 Stile 5″ wide, 7′-6″ long. One No. 1 Muntin 5″ wide, 4′ long.
No. 3 5/4x16″-10′	One No. 1 Stile 6″ wide and 7′-4″ long and a No. 2 Stile 5″ wide, 7′-6″ long. Also a No. 1 Muntin 5″ wide and 4′ long.

5/4 & Thicker No. 1 Shop—This piece is 25 inches wide by 16 feet long. It scales 33 feet surface measure. The total footage of acceptable door cuttings is 19½ feet, or 59%.


10"x28"=2 Ft. BOTTOM RAIL
6"x7'-0"=3½ Ft. - STILE
10"x36"=2½ Ft. BOTTOM RAIL
6"x 7'-6"=3¾ Ft. - STILE
6"x48"=2 Ft. MUNTIN
6"x 7'-6"=3¾ Ft. - STILE
6"x48"=2 Ft. MUNTIN

1 2 3

5/4 and Thicker Number 1 Shop



1 2 3

5/4 and Thicker Number 2 Shop

5/4 AND THICKER FACTORY GRADES (CONTINUED)

Number 2 Shop (5/4 and Thicker)

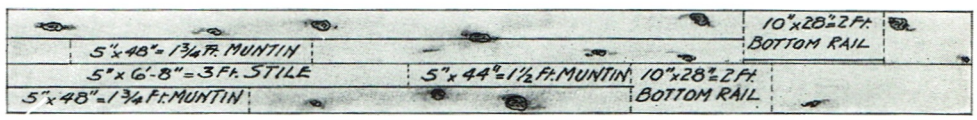
Each piece of No. 2 Shop produces one of the following percentages of door cuttings: 25 per cent of No. 1 cuttings; 33⅓ per cent of mixed No. 1 and No. 2 cuttings; 40 per cent of No. 2 cuttings in the same sizes as specified for No. 1 Shop and including top rails which must be of No. 1 quality but are counted as No. 2 cuttings.

No. 2 Shop is used by the industrial trade, and by woodworking plants producing doors, sash, frames, trim and mouldings.

Examples of No. 2 Shop

No. 1 5/4x14″–10′	One No. 1 Rail 10″ wide and 3′ long, and another No. 1 Rail 9″ wide and 28″ long.
No. 2 5/4x14″–10′	One No. 2 Stile 5″ wide, 7′-6″ long, and a No. 2 Rail 9″ wide, 28″ long. Also No. 1 Muntin 5″ wide and 3′-6″ long.
No. 3 5/4x18″–10′	One No. 1 Stile 6″ wide and 7′-6″ long, and a No. 1 Muntin 5″ wide, 4′ long.

5/4 & Thicker No. 2 Shop — This piece is 20½ inches wide by 16 feet long. It scales 27 feet surface measure and the total footage of acceptable door cuttings is 12 feet, or 44.4% .



ILLUSTRATED STANDARD HARDWOOD GRADES

Forsaking pinpoint accuracy for brevity, the following condensed grading explanation is nevertheless an excellent guide. For purposes of display, poorer boards illustrating limits were generally used in the following examples and as such are not to be construed as representative of the better stock also found in the same grade.

EXPLANATION

1. Like a thumb print, no two boards are exactly alike. Hardwoods are graded on percentage of yield in prescribed number of minimum size clear face cuttings.

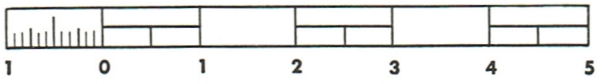
2. The following definitions apply to examples shown:
   Clear Face Cutting is clear one face. The reverse face to be free from heart pith, rot, shake, wane and unsound knots. **Surface Measure** is the square feet in the surface of any piece of any thickness.

3. In order of quality, the top three standard grades of hardwoods are:
   A. Firsts & Seconds (FAS) B. Selects C. No. 1 Common

4. In rough lumber, the grade is determined from the poorer side of the piece, except when otherwise specified (see Selects). In surfaced lumber (clear face cutting grades), the grade is determined from the better face with reverse side of cuttings sound. (See definition of sound cutting in N.H.L.A. rules).

5. Shaded areas on examples may be clear, usable lumber, but for grading purposes are considered waste. On the FAS examples, the black area representing wane does not exceed 25% of the first lineal foot and the shaded area represents 50% or more clear wood in the first lineal foot, as required by N.H.L.A. rules for FAS.

Scale ½" = 1 foot



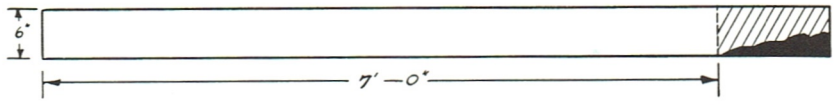
EXAMPLES

A. FIRSTS & SECONDS (FAS) GRADE

USE: For long, generally wide cuttings. As required for fixtures and interior trim.
BOARD SIZE: 6" and wider, 8' and longer.
(See exceptions page 17.)
NO. OF CLEAR FACE CUTTINGS: Determined by Surface Measure (S M.) of piece. (See illustrations below.)

SIZE OF CLEAR FACE CUTTINGS: 4" or wider by 5' or longer **and** 3" or wider by 7' or longer.
YIELD IN BOARD OF CLEAR FACE CUTTINGS: **83⅓% (10/12s) or more.**

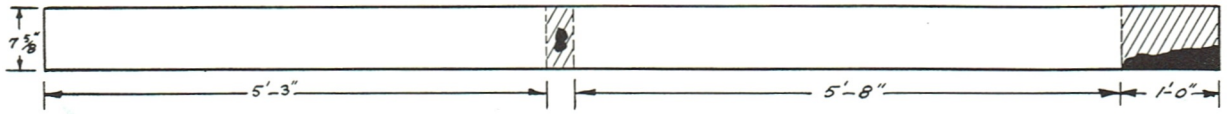
4' TO 7' S.M.* (Limit: 1 Clear Face Cutting)



EXAMPLE
1½" × 6" – 8' – 2" = 4' S.M.

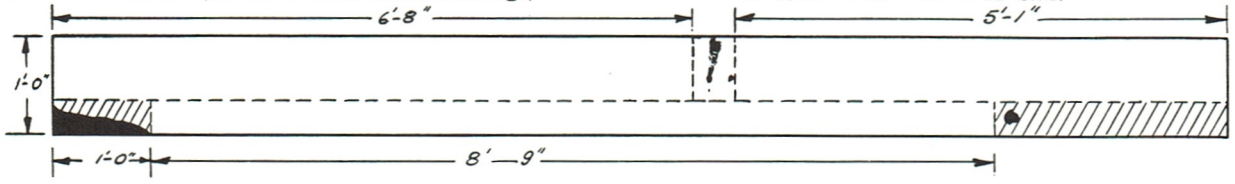
8' TO 11' S.M.* (Limit: 2 Clear Face Cuttings)

EXAMPLE
1" x 7⅝" – 12' – 2" = 8' S.M.



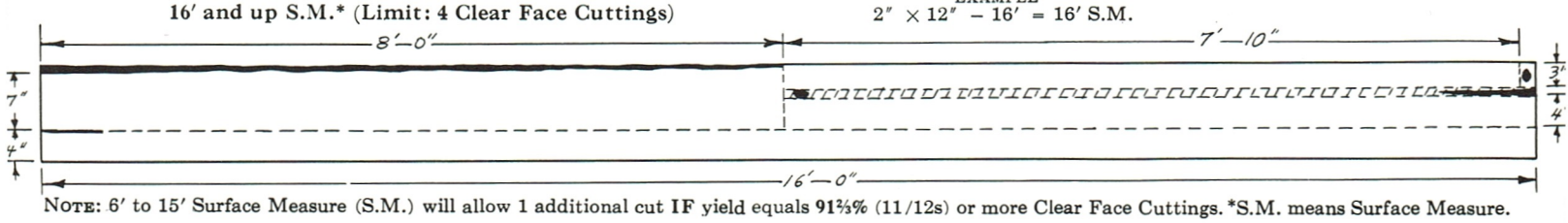
12' TO 15' S.M.* (Limit: 3 Clear Face Cuttings)

EXAMPLE
2" × 12" – 12' – 2" = 12' S.M.



16' and up S.M.* (Limit: 4 Clear Face Cuttings)

EXAMPLE
2" × 12" – 16' = 16' S.M.



NOTE: 6' to 15' Surface Measure (S.M.) will allow 1 additional cut **IF** yield equals **91⅔%** (11/12s) or more Clear Face Cuttings. *S.M. means Surface Measure.

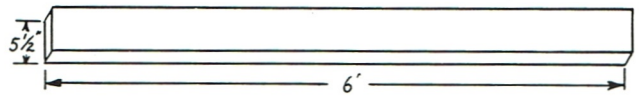
B. SELECTS GRADE

USE: For long, medium to narrow width cuttings, where only 1 good face is required. As required for moulding and wall paneling.

BOARD SIZE: 4″ and wider, 6′ and longer.

CLEAR FACE CUTTINGS AND YIELD: **Same as Firsts & Seconds (FAS) on better face.** Poorer face to grade not below No. 1 Common.

Exception on 2′ and 3′ S.M.* (Limit: 1 Clear Face Cutting yielding 91⅔%)



EXAMPLE
2″ x 5½″ – 6′ = 3′ S.M.

NOTE: FAS 1 Face Grade is same as Selects except 6″ and wider, 8′ and longer.

C. NUMBER 1 COMMON GRADE
(THRIFT GRADE)

USE: For medium length, narrow to wide cuttings. As required for furniture manufacture.

BOARD SIZE: 3″ and wider, 4′ and longer.

NO. OF CLEAR FACE CUTTINGS: Determined by Surface Measure (S.M.) of piece. (See illustrations below).

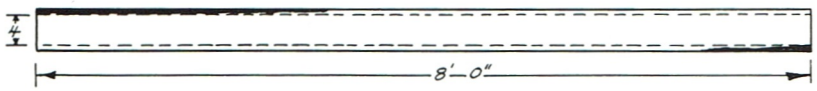
SIZE OF CLEAR FACE CUTTINGS: 4″ or wider by 2′ or longer **and** 3″ or wider by 3′ or longer.

YIELD IN BOARD OF CLEAR FACE CUTTINGS: (66⅔% (8/12s) or more.

1′ S.M.* (Limit: Clear Both Faces, 100% yield)

2′ S.M.* (Limit: 1 Clear Face Cutting, 75% yield)

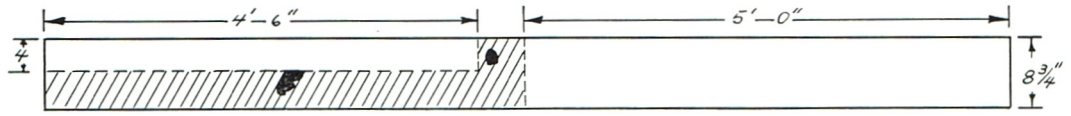
3′ AND 4′ S.M.* (Limit: 1 Clear Face Cutting, 66⅔% yield)



EXAMPLE
1″ × 5″ – 8′ = 3′ S.M.

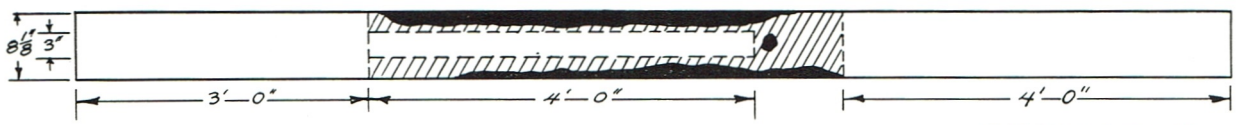
5′ TO 7′ S.M.* (Limit: 2 Clear Face Cuttings)

EXAMPLE
1½″ x 8¾″ – 10′ = 7′ S.M.



8′ TO 10′ S.M.* (Limit: 3 Clear Face Cuttings)

EXAMPLE
1″ × 8⅛″ – 12′ = 8′ S.M.

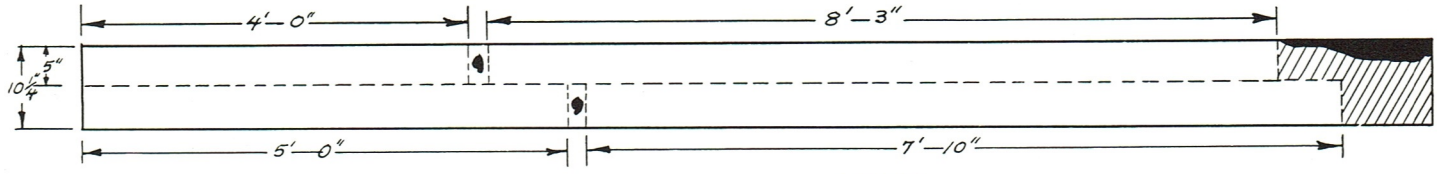


*S.M. Means Surface Measure

STANDARD HARDWOOD No. 1 COMMON GRADE, continued

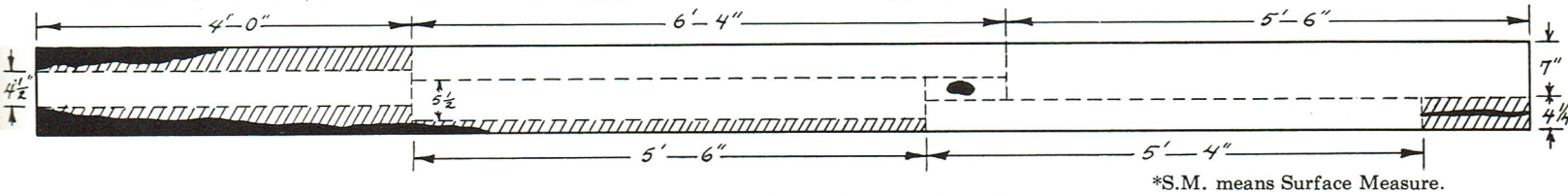
11′ TO 13′ S.M.* (Limit: 4 Clear Face Cuttings)

EXAMPLE
1¼″ × 10¼″ – 14′ = 12′ S.M.



14′ AND UP S.M.* (Limit: 5 Clear Face Cuttings)

EXAMPLE
2″ × 11¼″ – 16′ = 15′ S.M.



*S.M. means Surface Measure.

NOTE: 3′ to 7′ Surface Measure (S.M.) will allow 1 additional cut **IF** yield equals 75% (9/12s) or more clear face cuttings.

IMPORTANT EXCEPTIONS

(ALL GRADES)

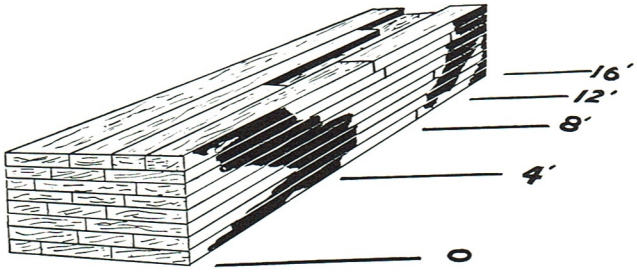
1. Walnut, Butternut and all quarter-sawn woods are 5″ and wider in Firsts & Seconds (FAS) grade.
2. Minimum size of Clear Face Cuttings in Walnut and Butternut are:
   a. **FAS:** 4″ or wider by 3′ or longer **and** 3″ or wider by 6′ or longer.
   b. **No. 1 Common:** A Clear Face Cutting shall not contain less than 144 sq. inches; minimum width 3″, minimum length 2′. There is no limit to number of cuttings.
3. FAS Poplar 8″ and wider must contain not less than 66⅔% heartwood on one side and not less than 50% on the reverse side. Pieces 7″ allow 1″ aggregate sapwood on either or both faces; pieces 6″ wide must be all heartwood. Clear stock with excessive sapwood is usually sold as "SAPS", or sometimes FAS (SND), meaning "sap-no-defect".

There are exceptions to some of the data in the foregoing, based upon peculiarities of the individual species. For complete, technical grading information, consult the N.H.L.A. grading rule book.

A-B-C-METHOD FOR MEASURING LUMBER

(Random Widths & Lengths Hardwoods)

A. DETERMINE LENGTH OF BOARD



SUGGESTION: Paint Footage Marks on shop floor.

C. TALLY CARD EXAMPLE

1″ LBR. = 64
1¼″ " add ¼ = 16 = 80
1½″ " " ½ = 32 = 96
2″ " double = 64 = 128

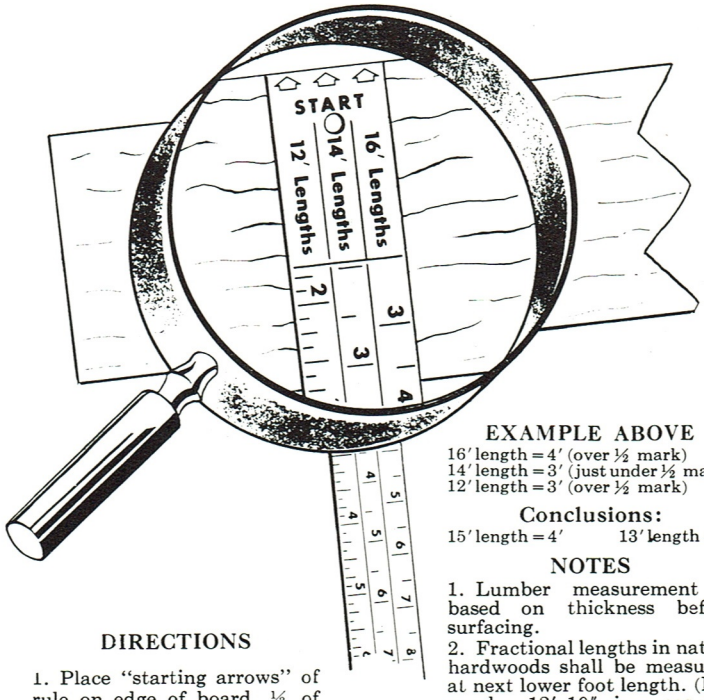
MEASURE ALL LBR. as 1″ and add as above when 1″ total is calculated.

THICKNESS..... SPECIES.....
GRADE.....

FOOTAGE PER BD.	PIECES	TOTAL PIECES	TOTAL FEET
1			
2			
3			
4	THL I	6	24
5	I	I	5
6	III	3	18
7			
8	I	I	8
9	I	I	9
10			
ETC.			
TOTAL		12	64

VINYLITE LUMBER RULE. A scratch-proof Vinylite Lumber Rule calculating board feet on both faces up to 18″ wide will be mailed free, on request, with any order. Additional Lumber Rules will be mailed postpaid at 50c each.

B. MEASURING WITH RULE



DIRECTIONS

1. Place "starting arrows" of rule on edge of board, ⅓ of length up from narrower end.
2. Read to right edge of board, along line indicating board's length, for board feet in lumber 1″ thick and less. (See C for measuring thicker lumber.)

EXAMPLE ABOVE

16′ length = 4′ (over ½ mark)
14′ length = 3′ (just under ½ mark)
12′ length = 3′ (over ½ mark)

Conclusions:

15′ length = 4′ 13′ length = 3′

NOTES

1. Lumber measurement is based on thickness before surfacing.
2. Fractional lengths in native hardwoods shall be measured at next lower foot length. (Example: 12′–10″ is measured 12′.) Fractions over 6″ in Mahogany shall be measured at next higher length.
3. Seldom do two men measure and arrive at same total (about 1% difference is normal either way).

HARDWOOD SHRINKS IN KILN DRYING

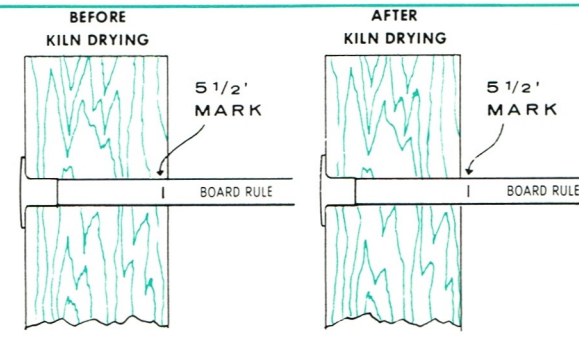
. . . . . BETWEEN 5′ AND 8′ ARE LOST FROM EACH 100′

Kiln shrinkage is important to hardwood users because they pay the loss! When you buy RW&L (random widths and lengths) hardwoods, kiln shrinkage loss is added to your cost in one of two ways:

. . . shrinkage loss is added into selling price . . . 100′ shipped and invoiced!

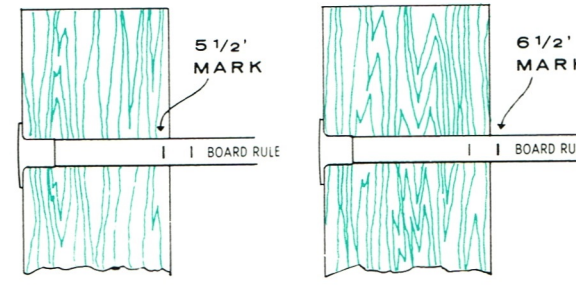
. . . shrinkage loss is added to measurement . . . 100′ is invoiced but net kiln dried footage (92′ to 95′) is shipped.

Assuming 15 boards measuring a total of 100 feet before kiln drying, between 5 and 8 of them will lose a foot in measurement in the kiln, as shown in the picture at the right. The kiln drying process shrank all 15 boards, but in only a part of them was the measurement affected. The variation in shrinkage (between 5′ per 100′ and 8′ per 100′) is largely the result of differences in the characteristics of different species . . . some woods simply shrink more than others.



Two sketches are of the same piece. Note it tallied 6 feet before kiln drying, but tallies only 5 feet out of the kiln.

Since hardwoods are sawn in varied widths (to minimize waste), no two boards are exactly the same size, so they are measured by a "Board Rule" instead of piece tallied. The "Board Rule" measures the surface feet in each board on a "give and take" basis; everything measuring between 5 1/2 and 6 1/2 is tallied as 6 feet; between 6 1/2 and 7 1/2 as 7 feet, etc. See preceding page for method of measuring random widths and lengths lumber.



Both above boards are tallied as 6 feet (surface measure).

BUYER TIPS

When buying kiln dried hardwoods, ask your supplier whether his prices are for:
(1) "kiln dried tally;" 100′ invoiced, 100′ shipped, or
(2) "air dried tally;" 100′ invoiced, net kiln dried footage shipped. If (2), ask supplier what he adds for kiln shrinkage.

Either method is regarded by the hardwood lumber industry as legitimate, so long as the customer knows what he's receiving. To sidestep kiln defects, specify "Inspection on Special Kiln Dried Rule" (Per National Hardwood Lumber Association). (NOTE: Kiln dried SOFTWOODS are always sold by reputable dealers on the basis of both measurement and inspection after kiln drying.

STANDARD THICKNESSES OF SURFACED LUMBER

HARDWOODS

ROUGH	SURFACED
3/8″	S2S to 3/16″
1/2″	S2S to 5/16″
5/8″	S2S to 7/16″
3/4″	S2S to 9/16″
1″	S2S to 25/32″ *
1 1/4″	S2S to 1 1/16″
1 1/2″	S2S to 1 5/16″
2″	S2S to 1 3/4″
2 1/2″	S2S to 2 1/4″
3″	S2S to 2 3/4″
3 1/2″	S2S to 3 1/4″
4″	S2S to 3 3/4″

PINES: Ponderosa, Sugar and Idaho

ROUGH	SURFACED
1″	S2S to 3/4″
1 1/4″	S2S to 1 5/32″
1 1/2″	S2S to 1 13/32″
2″	S2S to 1 13/16″
2 1/2″	S2S to 2 3/8″
3″	S2S to 2 3/4″
4″	S2S to 3 3/4″

*We recommend 1″ Walnut, Butternut, and any quarter or rift sawn hardwoods be S2S to 3/4″.

REDWOOD

ROUGH	SURFACED
1″	S2S to 3/4″
1 1/4″	S2S to 1 1/16″
1 1/2″	S2S to 1 5/16″
2″	S2S to 1 5/8″
2 1/2″	S2S to 2 1/8″
3″	S2S to 2 9/16″
4″	S2S to 3 9/16″

DOUGLAS FIR & SPRUCE

ROUGH	SURFACED
1″	S2S to 3/4″
1 1/4″	S2S to 1″
1 1/2″	S2S to 1 1/4″
2″	S2S to 1 1/2″
2 1/2″	S2S to 2″
3″	S2S to 2 1/2″
4″	S2S to 3 1/2″

WEIGHTS

Shipping Weight Averages

KILN DRIED LUMBER (1″ Thick) WEIGHTS

(Per 100 Feet, measured after kiln drying to 7% moisture content)

	Rough	S2S 25/32″		Rough	S2S 25/32″
Afrormosia	400	300	Mahogany (Genuine)	270	200
Alder, S2S 1/16″ Scant	250	205	Mahogany (Philippine)	320	240
Apitong (inc. Keruing & Yang)	420	315	Mansonia	300	225
Ash, Soft White or Brown	330	250	Maple, Hard	370	275
Ash, Tough White	365	275	Maple, Soft	320	240
Balsa	100	80	Meranti (Light Red)	300	225
Basswood	220	165	Oak, Red and White	400	300
Beech	400	300	Obeche	260	195
Birch	370	280	Padouk	400	300
Butternut	265	200	Paldao	350	260
Cedar, Aromatic Red	310	240	Pecan	420	315
Cherry	340	255	Pine, Parana	280	210
Chestnut	270	200	Pine, White and Ponderosa	220	175
Cottonwood	250	190	Pine, Yellow	320	240
Cypress	280	210	Poplar	290	215
Damar Minyak	230	175	Ramin	370	275
Ebony	600	450	Redwood	240	180(S4S)
Elm, Soft	310	235	Rosewood	400	295
Fir, Douglas	260	195(S4S)	Sassafras	270	205
Fir, White	230	175(S4S)	Spruce	240	180
Gum, Red	320	240	Sycamore	320	240
Gum, Sap	300	225	Teak	350	260
Hickory	440	330	Virola (including Banak)	270	200
Holly	330	250	Walnut	350	260
Korina*	340	255	Willow	250	185
Magnolia	300	225			

*Copyright trade name of U.S. Plywood Division, Champion International.

N.B. For best surfacing, we recommend 1″ Walnut, Butternut and all quarter sawn woods be S2S to ¾″.

PLYWOOD WEIGHTS

Per 100 Square Feet

Thickness	Fir	Pine	Hardwood
⅛″		38	40
3/16″		53	
¼″	75	70	80
⅜″	110	105	120
½″	140		160
⅝″	175		
¾″	210	200	240
1⅛″	320	305	

DOWEL ROD WEIGHTS

Size	Per Dozen Pieces	Per 100 Pieces
⅛″ x 36″	2 oz.	1.1 lbs.
3/16″ x 36″	5 oz.	2.5 lbs.
¼″ x 36″	8 oz.	4.5 lbs.
5/16″ x 36″	12 oz.	7.0 lbs.
⅜″ x 36″	1 lb. 4 oz.	9.5 lbs.
7/16″ x 36″	1 lb. 8 oz.	13.5 lbs.
½″ x 36″	2 lbs.	18.0 lbs.
⅝″ x 36″	3 lbs. 3 oz.	28.5 lbs.
¾″ x 36″	4 lbs. 6 oz.	39.0 lbs.
⅞″ x 36″	6 lbs. 1 oz.	53.0 lbs.
1″ x 36″	8 lbs.	68.0 lbs.

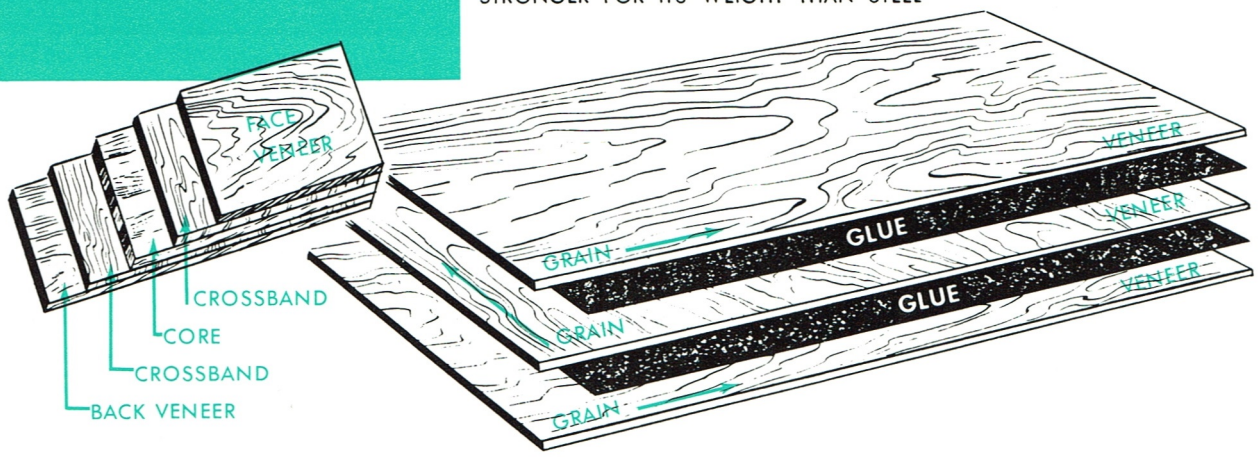
FURNITURE SQUARES

Kiln Dried — Rough

Size	Oak (each)	Gum (each)	Walnut (each)
2 x 2″ —24″	2¾ #	2¼ #	2½ #
2 x 2″ —30″	3½ #	2¾ #	3#
2 x 2″ —36″	4#	3½ #	3¾ #
2½ x 2½″—24″	3½ #	2¾ #	3#
2½ x 2½″—30″	4½ #	3½ #	4#
2½ x 2½″—36″	6½ #	5¼ #	5¾ #
3 x 3″ —24″	6¼ #	5#	5½ #
3 x 3″ —30″	7¾ #	6¼ #	7#
3 x 3″ —36″	9½ #	7½ #	8¼ #

PLYWOOD

STRONGER FOR ITS WEIGHT THAN STEEL



WHAT IS PLYWOOD?

Plywood is a crossbanded wood product made of layers of veneer and/or lumber with adhesives (glue).

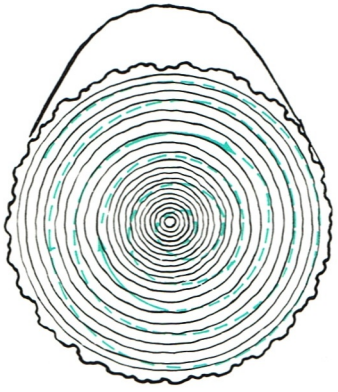
WHAT IS VENEER?

A thin sheet or layer of wood sliced or peeled from 1/100" to ¼" thick.

WHO INVENTED PLYWOOD?

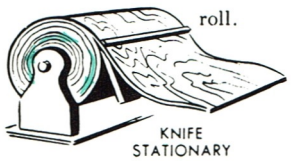
The answer to the origin of the art of veneering is sealed in the tombs of the Pharaohs. Over 1,500 years before Christ perfect specimens of veneered furniture were made by Egyptian artisans. Babylonians, Assyrians and Romans continued to advance the art.

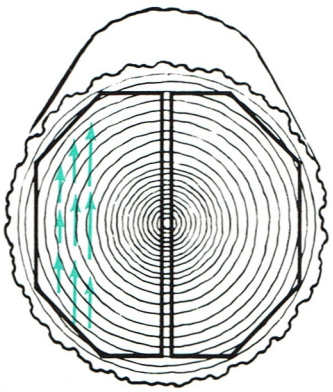
THREE PRINCIPAL METHODS OF VENEER MANUFACTURE



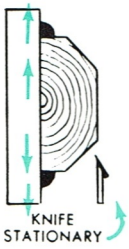
ROTARY CUTTING

Put on a lathe and revolved against knife. Veneer is unwound like paper from a roll.

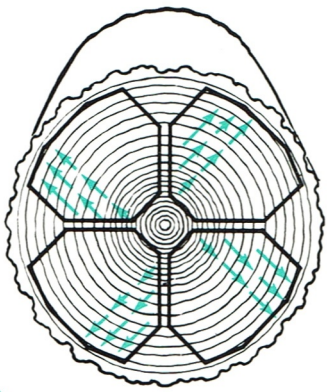




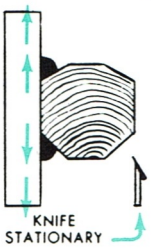
FLAT SLICING



Log HALVED and sliced parallel to axis of tree Clamped onto slicer moving up and down against knife, cutting veneer on downstroke.



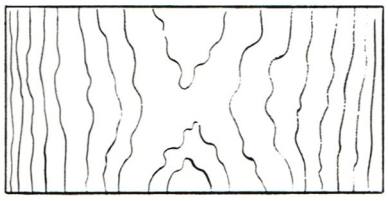
QUARTER SLICING



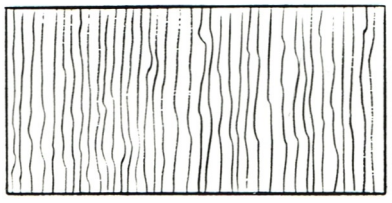
Log QUARTERED and sliced radially to growth of tree.

GRAIN CHARACTERISTICS

ROTARY



FLAT SLICED



QUARTER SLICED

WHAT IS NEW IN PLYWOOD?

Modern adhesives and big-volume manufacturing techniques are continually being improved. Today's plywood is the best ever and most reasonable in cost.

IS PLYWOOD STRONGER THAN SOLID WOOD?

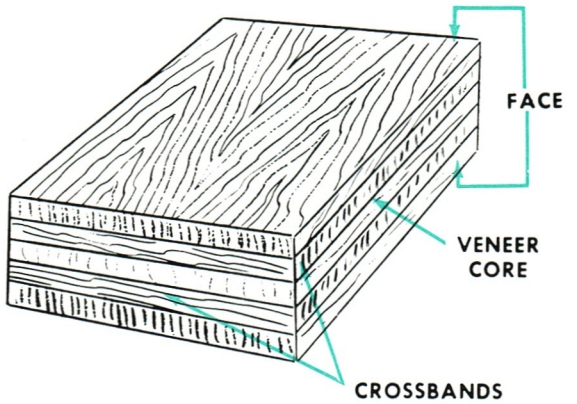
Generally, yes. Wood has more strength along the grain than across. Plywood's great strength lies in cross grain construction. This construction also reduces warping and eliminates splitting.

WHAT IS A PLY?

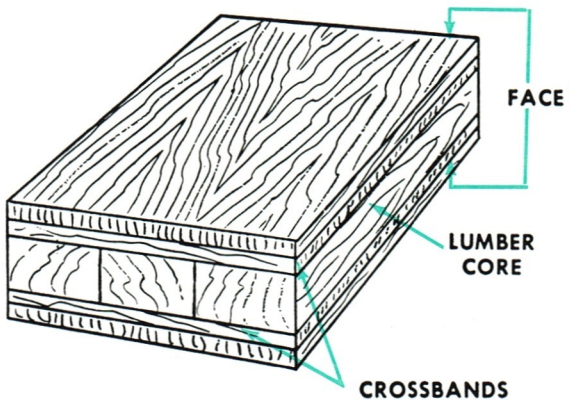
A layer of veneer. An odd number of plies (3, 5, 7, etc.) is generally used. Plies are selected in pairs and placed symmetrically on both sides of core to minimize internal stress. The greater the number of plies, the less tendency to twist.

TWO PRINCIPAL METHODS OF PLYWOOD CONSTRUCTION

VENEER CONSTRUCTION



LUMBER CORE CONSTRUCTION



WESTERN SOFTWOOD PLYWOOD

Standard Grades — Douglas Fir & Other Species
**Product Standard PS 1-66*

INTERIOR TYPE

Grade	Face Veneer	Back Veneer
N-N	N[1]	N[1]
N-A, N-B or N-D	N[1]	A[2], B[3] or D[4]
A-A	A[2]	A[2]
A-B	A[2]	B[3]
A-D	A[2]	D[4] (Int. Back)
B-D	B[3]	D[4] (Int. Back)
Underlayment[5]	C[4] (Repaired)	D[4] (Int. back)
C-D (Sheathing)[5]	C[4] (Ext. Back)	D[4] (Int. Back)
B-B (Concrete Form)[6]	B[3]	B[3]

EXTERIOR TYPE

Grade	Face Veneer	Back Veneer
A-A (So2S)	A[2]	A[2]
A-B (So/Sld)	A[2]	B[3]
A-C (So1S)	A[2]	C[4] (Ext. Back)
B-C (Sld/1S)	B[3]	C[4] (Ext. Back)
C (Repaired)-C	C[4] (Repaired)	C[4] (Ext. Back)
C-C (Sheathing)[5]	C[4] (Ext. Back)	C[4] (Ext. Back)
B-B (Concrete Form)[6]	B[3]	B[3]

1. "N" is top grade for natural finishes. Matched color and grain. Permits small repairs and up to 3 small mitered patches in 4' x 8' face. Usually found only in 3/4" plywood and not always available.
2. "A" is top painting grade. Sound; contains no knots or pitch pockets; permits numerous neat, mitered patches.
3. "B" is solid grade. Contains no large open defects but allows small tight knots, pitch streaks, discolorations, square-edged patches and synthetic plugs.
4. "C" and "D" grades permit numerous open defects. Normally used on back of panels with one good face; "C" on exterior type, "D" on interior type. "C-plugged" veneer is patched for use in underlayment.
5. All Fir plywood is sanded 2 sides except sheathing, which is normally unsanded. Sheathing is also obtainable with plugged face, in which case it may be touch sanded. Underlayment and Sheathing are same grade except veneer directly under face veneer is C in the former, D in the latter.
6. Unless otherwise specified; Concrete form Fir plywood is oiled on faces and edges sealed at the factory.

HARDWOOD PLYWOOD STANDARD GRADES

**(Commercial Standard 35-61)*

Grade	Face Veneer	Allowable Defects
1	PREMIUM—Book or slip matched for pleasing effect	Burls, pin knots, slight color streaks and inconspicuous small patches in limited amounts.
1	GOOD—Unmatched, but sharp contrasts in color, grain and figure not permitted	Burls, pin knots, slight color streaks and inconspicuous small patches in limited amounts.
2	SOUND—Free from open defects; a painting grade.	All appearance defects permitted so long as smooth and sound. Smooth patches permitted.
3	UTILITY	All natural defects; including open knots, wormholes and splits, maximum size of which are defined.
4	BACKING	Defects practically unlimited; only strength and serviceability are considered.

In order to show hardwood plywood face veneer grades at a glance, the information given in the above chart has been greatly over-simplified. For complete grading rules, including specialty grades, grading of cores and the like, see commercial standards 35-61. Any grade combination of face and back veneers can be obtained in hardwood plywood, although dealer's stocks are ordinarily limited to the combinations most popular in the trade.

*Can be obtained from Supt. of Documents, Washington, D.C. 20402.

INTRODUCTION TO WOODS

The charts on the next nine pages detail principal characteristics of more than 250 different woods from around the world. Twenty-seven pages following the charts are devoted to little stories about some of our better known woods.

These listings are not a complete record of anything; the purpose has been to include woods now available in United States lumber markets, or expected to be offered here within the forseeable future, and it is most unlikely that even this modest goal has been reached without oversight or error.

Now, an explanation of the headings and abbreviations used in the charts:

1&2. "Common Name" is that by which the wood is presumed to be best known to most people. "Other Common Name" is included as a cross reference, because the same common name is often used to identify many entirely different species.

3. "Botanical Name" is the latin name assigned by a recognized botanist. Common names are unreliable and misleading. Example: one of the lexicons in the Paxton library lists 197 different common names for a single species. The latin name affords positive identification because it is the same everywhere in the world.

Under "Botanical Name," the term "spp." is an abbreviation of the plural of species. It indicates that several closely related species of the genus shown are cut and marketed together . . . a common practice in a fairly common situation.

4. "Color" refers to heartwood only. Color descriptions are unavoidably inexact; a personal sense of a wood's color can best be gained by personal examination.

Under "Color," most of the abbreviations are self-explanatory; "lt." means light; "r." means red or reddish; "y." yellow or yellowish; "brn." brown; "wh." white; "dk." dark, etc.

5. "Density" ratings are assigned on the per-thousand-board-feet weight of thoroughly air dried or kiln dried lumber in the rough. Ratings are as follows:

2500 lbs. or less . . . . . Soft
over 2500 to 3600 lbs. . . . . Medium
over 3600 to 4800 lbs. . . . . Hard
over 4800 lbs. . . . . Very Hard

6. "Texture" refers to the general physical composition of the wood . . . the ratings "fine," and "coarse" are self-explanatory. Texture affects both superficial and finishing qualities.

7. "Grain" is a guide to the growth characteristics of the tree. The term "straight" in this context is self-explanatory; "roey" is an industry term meaning that the grain is interlocked, irregular or wavy. Woods with roey grain nearly always display ribbon stripe figure on quarter section.

8. "Ease of Working" is graded as:

(1) Very easy to work.
(2) Moderately easy to work.
(3) Difficult to work.
(4) Carbide-tipped tool edges recommended.

9. "Stability" refers to the wood's tendency to stay in place, both before and after it is worked. Ratings are:

(1) Exceptionally stable.
(2) Of satisfactory stability.
(3) Below Average in stability.

Woods rated below average in stability can nearly always be used successfully when the nature of this characteristic is understood.

10. "Durability" refers to rot resistance in situations favoring decay, e.g., in direct contact with the earth. It also refers to heartwood only, as NO sapwood is durable in this sense. Conversely, any wood not exposed to unfavorable conditions is "durable" in the sense of lasting so long as it remains dry . . . there is no such thing as "dry rot."

"Durability" ratings are as follows:

(1) Exceptionally durable.
(2) Moderately durable.
(3) Not durable in this sense.

11. "Availability" needs no explanation except to say that this rating refers only to the United States market.

Ratings are:

(1) Normally found on U.S. market.
(2) Usually obtainable on order.
(3) Not commonly marketed in the U.S. but possibly obtainable through extra effort.
(4) Generally unavailable because rare, or because export forbidden by country of origin.

12. "Source" refers to geographical origin. Listings include only principal recorded sources . . . not necessarily all of them.

"Source" abbreviations are easily decipherable, a possible exception being "P.I." for Philippine Islands.

13. "Cost" refers to no particular figure. It is an attempt merely to compare the wood's price with the price of other species from the same general area.

14. "Beauty Rating:" woods of pronounced color and figure, with desirable finishing characteristics, rate best and are generally most favored. But this is largely a matter of current opinion . . . fashions change and yesterday's ugly duckling often becomes today's reigning beauty. No wood, properly handled, is ever in itself ugly.

Common Name	Other Common Name	Botanical Name	Color	Density	Texture	Grain	Ease of Working	Stability Rating	Dura-bility	Availability	Source	Cost	Beauty Rating
ABURA	popo	*Mitragyna ciliata*	lt. brown	medium	medium	straight to roey	2	2	3	2	West Africa	low	4
ACACIA	Australian blackwood	*Acacia melanoxylon*	striped dark brown	hard	med. fine	straight to roey	2	2	1	3	Australia	high	1
ACEITUNO	marupa	*Simarouba amara*	yellowish white	soft	medium	straight	1	1	3	2	Mexico to South America	low	3
*AFRORMOSIA	kokrodua (African teak)	*Pericopsis elata*	lt. brown	med. hard	fine	straight to roey	2	1	1	1	West Africa	medium	1 to 2
AGBA	tola	*Gossweilerodendron balsamiferum*	brown	medium	fine	straight to wavy	1	1	1	2	West Africa	medium	2
AIELE	canarium	*Canarium schweinfurthii*	tan	soft	medium	roey	4	3	3	2	West Africa	low	3
*ALDER, RED	(none in U.S.)	*Alnus rubra*	pale reddish brown	medium	fine	straight	2	1	3	1	Western U.S.	medium	2
ALERCE	South American redwood	*Fitzroya cupressoides*	red	soft	fine	straight	1	1	1	2	Chile and Argentina	medium	3
ALSTONIA	emien	*Alstonia boonei & congensis*	cream	soft	fine	staright to roey	2	2	3	3	West Africa	low	4 (latex streaks)
AMARANTH	purpleheart	*Peltogyne spp.*	purple	very hard	fine	straight to wavy	3	1	1	2	South America	high	1
AMARILLO	balaustre, arariba	*Centrolobium paraense*	streaked yel. to red	very hard	fine	straight to roey	2	2	1	3	Central and South America	high	1
AMBOYNA BURL	(padauk relative)	*Pterocarpus spp.*	yellow to red	hard (varies)	medium	twisted	3	2	3	2 (veneers only)	S.E. Asia	high	1
*AMBURANA	cerejeira, cumare	*Amburana cearensis*	pale yel. brown	medium	coarse	straight to roey	3	2	2	1 - 2	Argentina and Brazil	medium	2
*ANDIROBA	crabwood, cedro macho	*Carapa guianensis*	light reddish brown	med. hard	medium	straight to roey	2	2	2	1	West Indies, C.A. and Brazil	medium	2
ANGELIQUE	basra locus	*Dicorynia guianensis*	varied brown	very hard	medium	straight	2	2	1	2	Brazil	medium	3 - 4
APAMATE	mayflower	*Tabebuia rosa*	brown	medium	medium	straight to roey	1	1	1	2	Mexico to South America	medium	2
*APITONG	keruing, yang	*Dipterocarpus spp.*	brownish red	hard	coarse	straight to roey	3	2	1	1	P.I., Malaysia, Thailand	medium	3
APPLE	crab apple, garland tree	*Malus spp.*	reddish brown	hard	fine	straight to irregular	2	1	2	4	United States	high	2
ASADA	Japanese cherry	*Ostrya japonica (birch family, not cherry)*	light reddish brown	hard	fine	straight	2	2	3	lumber 3 plywood 1	Japan	medium	2
*ASH	(none in U.S.)	*Fraxinus spp.*	white to light tan	medium	coarse	straight	2	1	2	1	Northern and Eastern U.S.	medium	2
*ASPEN	popple	*Populus tremuloides*	very pale tan	soft	coarse	straight	2	2 - 3	3	1	Northern and Eastern U.S.	low	3
ASTA	solero	*Guatteria boyacana*	lt. olive	very hard	fine	straight	1	1	3	3	Mexico to South America	high	2
AVODIRE	white mahogany	*Turreanthus africana*	blond	medium	medium	roey	2	1	3	2 - 3	West Africa	high	1
*BALSA	corkwood	*Ochroma pyramidale*	pale tan	very soft	coarse	straight	2	2	3	1	Ecuador and Latin America	medium	4
*BANAK (also see virola)	mahban	*Virola spp.*	reddish brown	soft	medium	straight	1	2	3	1	Central and South America	low	2
*BASSWOOD	American linden	*Tilia glabra & heterophylla*	white to pale brown	soft	fine	straight	1	1	3	1	Eastern U.S.	medium	3
BATAI	(none in U.S.)	*Albizia falcataria*	blond	soft	medium to coarse	roey	2	2	3	3	tropical plantations	unknown	4
BEAN, BLACK	bean tree	*Castanospernum australe*	brown	hard	medium	straight to roey	2	2	3	3	Australia	high	2
BEECH, EUROPEAN	buna	*Fagus sylvatica*	light pinkish tan	med. hard	fine	straight	2	1	2	3	Europe	med. high	2

*Woods marked with asterisk are also included in stories about woods, which follow the charts.

Common Name	Other Common Name	Botanical Name	Color	Density	Texture	Grain	Ease of Working	Stability Rating	Dura-bility	Availability	Source	Cost	Beauty Rating
*BEECH (U.S. and Canada)	(none in U.S.)	*Fagus grandifolia*	pale reddish brown	med. hard	medium	straight	2	1	2	1	Eastern U.S.	medium	2
BEEFWOOD	bulletwood	*Manilkara spp.*	red	very hard	fine	straight	3	2	1	2	Central and South America	high	2
BENGE	ehie, kevazingo	*Guibourtia arnoldiana & ehie*	brown	hard	medium	wavy	2	2	2	1 - 2	West Africa	med. high	1
BERLINIA	melegba	*Berlinia spp.*	reddish brown	hard	coarse	roey	3	2	2	2	West Africa	medium	3
BILINGA	opepe	*Nauclea diderrichii*	orange brown	hard	coarse	roey	2	2	2	2	Africa	medium	4
*BIRCH	boileau (Canada)	*Betula spp.*	pale brown	hard	fine to medium	straight	2	2	3	1	Eastern U.S. and Canada	med. high	2
*BIRCH, PAPER	white birch, canoe birch	*Betula papyrifera*	off-white	medium	fine	straight	2	2	3	1 - 2	Eastern U.S. and Canada	medium	3
BLACKWOOD AFRICAN	grenadillo	*Dalbergia melanoxylon*	black	very hard	fine	straight	3	1	2	4	East Africa	high	2
BLOODWOOD	(none known)	*Eucalyptus corymbosa*	red	hard	coarse	roey	3	2	1	3	Australia	medium	3
BOIS D'ARC	osage orange, hedge	*Maclura pomifera*	yellow	very hard	fine	irregular	3	2	1	4	U.S.	high	3
*BOX ELDER	ash-leaved maple (please see soft maple; as lumber, box elder is usually mixed with it.)	*Negundo aceroides*	y. brown	soft	medium	straight	2	2	3	1 - mixed w/soft maple	E. U.S., Canada, Pacific N.W.	med. low	3
BOXWOOD, GENUINE	Turkish boxwood	*Buxus sempervirens*	lt. yellow	very hard	extremely fine	straight to irregular	1	1	2	4	S. Eur., N. Afr., W. Asia	unknown	2
BOXWOOD SAN DOMINGO	pau branco	*Phyllostylon brasiliensis*	lt. yellow	very hard	fine	straight	2	2	3	2	Mexico to S. America	high	3
BRAUNA	maria preta	*Melanoxylon brauna*	chocolate brown	very hard	fine	straight to roey	3	2	1	2	Brazil	medium	2
BRAZIL NUT	castanheiro	*Bertholletia excelsa*	lt. brown	hard	coarse	roey	2	2	3	3	S. America	medium	3
BRAZILWOOD	pernambuco	*Guilandina echinata*	orangey red	very hard	fine	straight to roey	2	1	2	2	Brazil	high	2
*BUBINGA	African rosewood	*Guibourtia spp.*	deep red or maroon	hard	fine	straight	2	1	1	1	West Africa	high	1
BUCKEYE	horse chestnut	*Aesculus glabra & octandra*	white	medium	fine	straight	1	2	3	2	United States	medium	3
*BUTTERNUT	white walnut	*Juglans cinerea*	lt. brown	soft	medium	straight to irregular	2	2	2	1	Eastern U.S.	high	1
CABREUVA	oleo de macaco	*Myrocarpus frondosus*	cocoa brown	very hard	fine	roey	3	2	2	2	Brazil	medium	2
CAMPHORWOOD	kusonoki	*Cinnamomum camphora*	lt. yellowish brown	soft	fine	straight to roey	2	2	3	2 - 3	Orient	high	2
CANAFISTULA	horse bush	*Peltophorum vogelianum*	reddish brown	very hard	medium	roey	3	2	1	3	W. Indies & Argentina	unknown	3
CANALETE	geiger tree, cordia	*Cordia spp.*	streaked brown	very hard	medium	straight to roey	3	2	1	3	Florida thru Brazil	high	2
CAPIRONA	pau mulato	*Calycophyllum spruceanum*	lt. yellow	hard	fine	straight	2	2	3	2	S. America	medium	3
CAPOMO	ojoche, breadnut	*Brosimum alicastrum and others*	white to pale yellow	hard	fine	straight	4	2	3	2	Mexico to S. America	medium	2
CATIVO	trementino	*Prioria copaifera*	pale brown	soft	fine	straight	1	1	3	1	C. America and Jamaica	low	4
*CEDAR, ALASKA	yellow cedar	*Chamaecyparis nootkatensis*	pale y. tan	soft	fine	straight	1	1	1	2	N. Calif. thru Coast. Alaska	med. low	3
*CEDAR, AROMATIC RED	juniper	*Juniperus virginiana*	heart: red sap: white	medium	fine	irregular (knotty)	2	1	1	1	Southern & Eastern U.S.	medium	2
*CEDAR, NORTHERN WHITE	arbor vitae	*Thuja occidentalis*	pale tan	soft	fine	irregular (knotty)	2	1	1	3 (as lumber)	Northern U.S. & E. Canada	unknown	4

*Woods marked with asterisk are also included in stories about woods, which follow the charts.

Common Name	Other Common Name	Botanical Name	Color	Density	Texture	Grain	Ease of Working	Stability Rating	Dura-bility	Availability	Source	Cost	Beauty Rating
*CEDAR, PORT ORFORD	ginger pine, Lawson's cypress	*Chamaecyparis lawsoniana*	pale tannish yellow	soft	fine	straight	1	1	1	2	Coast, Oregon and California	medium	3
*CEDAR, SOUTHERN WHITE	post cedar	*Chamaecyparis thyoides*	pale pinkish brown	soft	fine	straight	1	1	1	2	Southern U.S.	medium	3
*CEDAR, SPANISH	cedrela	*Cedrela odorata*	pale brown to red	soft to medium	medium	straight to roey	1	1	1	2	Latin America	medium	2 (excessive gum)
*CEDAR, WESTERN RED	shinglewood	*Thuja plicata*	reddish brown	soft	medium	straight	1	1	1	1	N. Calif. to Alaska	med. low	3
CHAPLASH	jackwood	*Artocarpus chaplasha*	yellowish brown	med. soft	medium	straight to roey	1	2	2	3	E. India, Burma, Andaman Isls.	high	2
CHEN CHEN	antiaris	*Antiaris africana & welwitschii*	white to yel. white	soft	medium coarse	roey	2	3	3	2	West Africa	low	4
*CHERRY	fruitwood	*Prunus serotina*	med. reddish brown	medium	fine	straight	2	1	2	1	Eastern U.S.	med. high	1
*CHESTNUT	(none in U.S.)	*Castanea dentata*	pale grayish brown	medium	coarse	straight	1	1	1	1, but wormy only	Eastern U.S.	high	2
CHINQUAPIN	dwarf chestnut	*Castanea pumila*	pale brown	medium	coarse	straight	2	2	1	2	United States	medium	3
COACHWOOD	rose mahogany	*Ceratopetalum apetalum*	lt. brown	hard	fine	straight	2	2	2	3	Australia	high	2
*COCOBOLO	Nicaragua rosewood	*Dalbergia retusa*	streaked dk. brown	hard	medium	roey	2	2	1	2	Mex., C. Amer., and Columbia	high	1
COCUS WOOD	West Indian ebony	*Brya ebenus*	dk. brown	very hard	very fine	straight to roey	2	1	1	3	W. Indies	high	1
COFFEE TREE, KENTUCKY	mahogany	*Gymnocladus dioicus*	reddish brown	hard	coarse	straight	2	2	1	4	Southern U.S.	medium	2
COIGUE	guindo	*Nothofagus betuloides*	pale brown	hard	fine	straight	2	3	3	3	Chile	medium	3
*COTTONWOOD	western poplar, Balm of Gilead	*Populus spp.*	pale brown	soft	medium	straight	1	3	3	1	Eastern U.S., Calif., Canada	low	3
COURBARIL	South American locust	*Hymenaea courbaril*	reddish brown	hard	medium	roey	2	1	2	3	Mexico to S. America	unknown	2
*CYPRESS	bald cypress, swamp cypress	*Taxodium distichum*	orangey brown	soft	medium coarse	straight	1	1	1	1	Southern U.S.	medium	2
DAHOMA	tom	*Piptadenia africana*	golden brown	med. hard	medium	straight to roey	2	3	1	2	West Africa	medium	2
*DAMAR MINYAK	almaciga (P.I.) kauri pine (Aus.)	*Agathis alba*	pale tan	soft	fine	straight	1	2	3	1	S.E. Asia, P.I. & Australia	medium	2
DETERMA	louro vermelho	*Ocotea rubra*	lt. reddish brown	medium	medium	roey	2	1	1	2	S. America	medium	2
*DOGWOOD	cornel	*Cornus florida*	lt. brown	hard	very fine	straight	1	2	3	4	Eastern U.S.	unknown	3
DOUSSIE	afzelia	*Afzelia spp.*	brown	hard	coarse	roey	2	2	2	2	Africa	medium	2
*EBONY	gabon ebony, macassar ebony	*Diospyros spp.*	(G) solid blk. (M) strkd. blk.	very hard	fine	straight to irregular	3	2	1	1	Gabon; W. Africa, Macassar: P.I. & E. Indies	very high	1
EKKI	azobe (trade name)	*Lophira alata*	dk. reddish brown	very hard	coarse	roey	3	2	1	3	West Africa	medium	3
*ELM	gray elm, soft white elm, wahoo	*Ulmus spp.*	pale brown (grayish)	medium	coarse	straight to irregular	2	2	3	1	Eastern U.S., S.E. Canada	med. low	2
ELM BURL, CARPATHIAN	(none)	*Ulmus campestris*	reddish gray (varied)	medium	coarse	irregular	3	3	3	2 veneers only	England, Carpathian mtns.	high	1
EMERI	framire, idigbo	*Terminalia ivorensis*	blond	medium	medium	straight to wavy	2	2	3	2	West Africa	med. high	2
ESPAVE	wild cashew	*Anacardium excelsum*	brown	soft	coarse	roey	3	3	2	2	Central America	medium	4
FAUX SATINE	cypress crotch	*Taxodium distichum*	pale tan	soft	coarse	irregular	3	2	1	3 veneers only	Southern U.S.	high	1

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Common Name	Other Common Name	Botanical Name	Color	Density	Texture	Grain	Ease of Working	Stability Rating	Dura-bility	Availability	Source	Cost	Beauty Rating
*FIR, DOUGLAS	Oregon pine	*Pseudotsuga taxifolia*	reddish brown	medium	coarse	straight	2	2	2	1 - const. & plywood	Western U.S., Canada, Mexico	med. low	4
*FIR, RED	noble fir, etc.	*Abies spp.*	medium brn. red	medium	coarse	straight to irregular	2	2	3	2	Western U.S.	low	4
*FIR, WHITE	silver fir	*Abies spp.*	off-white to lt. tan	soft	coarse	straight to irregular	2	2	3	1 - constr. grades only	Western U.S.	low	4
FUSTIC	Dryer's mulberry	*Chlorophora tinctoria*	yellow to lt. brown	very hard	medium	roey	2	2	2	2	Mexico to North S. Amer.	medium	2
GABOON	okoume, samara	*Aucoumea klaineana*	lt. pink	soft	medium	roey	4	2	3	2	West Africa	medium	3
GERONGGANG	(none in U.S.)	*Cratoxylon arborescens*	dk. red	medium	coarse	roey	2	2	2	3	Malaysia	medium	2
GOLA	(none in U.S.)	*Tetraberlinia tubmaniana*	lt. reddish brown	medium	coarse	roey	2	2	3	2	Liberia	medium	3
*GONCALO ALVES	pau goncalo, mura	*Astronium spp.*	streaked gold. brown	very hard	fine	roey	3	2	2	2	Mexico thru tropical S.A.	high	1
GRANADILLO	(grenadillo . . . these names are used on at least twenty entirely different woods, so more identification needed. See African blackwood)												
GREENHEART	beeberoe	*Ocotea rodiaei*	dk. olive	very hard	fine	straight	3	2	1	1	Guianas	high	3
*GUANACASTE	kelo bra, jenisero, geneziro	*Enterolobium cyclocarpum*	med. to dk. brn streaked	medium	medium	straight to roey	2	2	2	2	Central thru Northern S.A.	high	1
GUAREA, BLACK	Nigerian cedar, bosse	*Guarea thompsonii*	lt. reddish brown	hard	med. fine	straight to roey	2	2	3	2	West Africa	medium	2
GUAREA, WHITE	Nigerian pearwood	*Guarea cedrata*	pink to lt. brown	medium	med. fine	roey	2	2	2	2	West Africa	medium	2
*GUM, BLACK	sour gum	*Nyssa sylvatica and biflora*	pale yel. brown	medium	fine	irregular	2	3	3	1-usually mixed w/tupelo	S.E. U.S.	med. low	3
*GUM, RED	sweet gum, hazel	*Liquidambar styraciflua*	reddish brown	medium	fine	straight	2	2	3	1	S.E. U.S.	med. high	2
GUMBIXAVA	balata rosada	*Micropholis gardnerianus*	reddish brown	hard	medium	straight	2	2	3	1 - 2	S. America	medium	2
GUMBO - LIMBO	almacigo	*Bursera simaruba*	white	soft	med. fine	straight	1	2	3	2	Mexico to S. America	low	4
GURJUN	(none in U.S.)	*Dipterocarpus turbinatus*	reddish brown	hard	medium	straight to roey	2	2	1	2	India and Indo-China	medium	3
*HACKBERRY	sugarberry, beaverwood	*Celtis occidentalis (H.) Celtis laevigata (S.)*	grayish off-white	medium	coarse	straight	2	3	3	2	Eastern U.S.	med. low	3
HAREWOOD	English sycamore, silver graywood	*Acer pseudoplatanus*	white. (dyed silver gray)	medium	medium coarse	straight	2	2	3	4 veneers only	England	high	1
*HEMLOCK, EASTERN	hemlock spruce	*Tsuga canadensis*	pale grayish brown	med. soft	coarse	irregular	2	2	3	1 - constr. grades only	Eastern U.S. and Canada	low	4
*HEMLOCK WESTERN	Alaska pine	*Tsuga heterophylla*	pale grayish brown	med. soft	coarse	straight to irregular	2	2	3	1	Western U.S.	med. low	3
*HICKORY	shagbark, pignut, mockernut hickory	*Hicoria spp.*	lt. brown	hard	medium coarse	straight	3	2	3	1	Eastern North America	medium	2
*HOLLY	(none in U.S.)	*Ilex opaca*	chalky white	med. hard	med. fine	straight	2	2	3	1	Eastern U.S.	medium	3
HORNBEAM	hop hornbeam, ironwood	*Ostrya virginiana*	rosy brown	hard	fine	straight to irregular	3	2	3	3	Eastern and S.W. U.S.	unknown	2
ILOMBA	pycnanthus	*Pyncanthus angolensis*	lt. pinkish brown	soft	coarse	straight	1	2	3	2	West Africa	low	4
IMBUIA	Brazilian walnut	*Phoebe porosa*	brown	med. hard	fine	straight to roey	2	2	3	3	Brazil	high	2
IPE	corona nigra, lapacho	*Tabebuia spp. (lapacho group)*	dk. reddish brown	very hard	fine	roey	3	1	1	2	S. America	medium	2
IPIL	merbau	*Intsia spp.*	dk. reddish brown	med. hard	medium	roey	2	1	2	2 - 3	P.I. and Indonesia	high	2

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Common Name	Other Common Name	Botanical Name	Color	Density	Texture	Grain	Ease of Working	Stability Rating	Dura-bility	Availability	Source	Cost	Beauty Rating
IROKO	kambala	*Chlorophora escelsa and regia*	dk. brown	med. hard	medium coarse	roey	2	2	1	2	Africa	medium	2
IVORY WOOD	(boxwood substitute)	*Siphonodon australe*	yellowish white	hard	very fine	straight	2	1	3	3	Australia	high	2
JABILLO	catahua, hurawood	*Hura crepitans*	varied white to brown	soft	medium	roey	2	2	3	2	Mexico to S. America	low	4
JARRAH	West Australian mahogany	*Eucalyptus marginata*	dark reddish brown	hard	medium coarse	straight to roey	3	2	1	3	Western Australia	high	3
JELUTONG	(none in U.S.)	*Dyera costulata*	blond	soft	fine	straight	2	2	3	2	Malaysia	medium	4 (latex canals)
JEQUITIBA	albarco	*Cariniana pyriformis*	brown	medium	medium	straight to roey	4	2	3	2	S. America	medium	2
KAPUR	keladan	*Dryobalanops spp.*	lt. reddish brown	hard	coarse	straight	2	2	1	2	Malaysia	medium	4
KARRI	(none in U.S.)	*Eucalyptus diversicolor*	dk. red	hard	medium	roey	3	3	2	2	Australia	medium	4
KASAI	malugai	*Pometia spp.*	dk. reddish brown	medium	medium	roey	2	3	2	3	S.E. Asia and P.I.	medium	3
KEMPAS	tualang, manggis	*Koompassia malaccensis and escelsa*	red	hard	coarse	roey	3	2	3	2	Malaysia and Indonesia	medium	3
*KINGWOOD, VIOLET	violetwood	*Dalbergia cearensis*	striped violet brown	very hard	fine	roey	3	2	1	4	Brazil	very high	1
*KOA	(none in U.S.)	*Acacia koa*	golden brown	med. hard	fine	roey	2	2	2	1	Hawaii	med. high	1
KOKKO	siris, lega	*Albizia lebbek*	brown	medium	coarse	roey	2	2	2	3	S.E. Asia	medium	2
*KORINA	limba, afara	*Terminalia superba*	very pale yel. white	medium	fine	straight	1	1	3	1	West Africa	med. high	1
KOSIPO	omu	*Entandrophragma candollei*	brown	medium	coarse	roey	3	3	2	3	West Africa	medium	3
LACEWOOD	silky oak	*Cardwellia sublimis*	pinkish brown	hard	coarse	straight	2	2	3	3	Queensland, Australia	high	2
LARCH	tamarack	*Larix occidentalis*	pale brown	medium	coarse	straight	2	2	3	1	U.S.	low	4
LAUREL, EAST INDIAN	East Indian walnut	*Terminalia tomentosa*	striped brown	hard	medium	straight to roey	2	2	2	3	India & Burma	high	1
*LEMONWOOD	degame	*Calycophyllum candidissimum*	yellowish white	hard	fine	straight	2	2	3	4	Cuba	unknown	3
*LIGNUM VITAE	guaiacum wood	*Guaiacum spp.*	olive brown	very hard	fine	roey	2	1	1	2	Mexico to Colombia	high	3
LIME	linden, European basswood	*Tilia europaea*	white	soft	fine	straight	1	1	3	4	Europe	unknown	3
*LOCUST, HONEY	thorn tree	*Gleditsia triacanthos*	reddish brown	hard	medium coarse	straight to irregular	3	2	2	3	Eastern U.S.	med. high	2
LOGWOOD	campeche, brazilette	*Haematoxylon spp.*	reddish brown	very hard	fine	roey	2	2	2	3	Central thru S. America	medium	2 (a dyewood)
LONGUI	mbebame	*Chrysophyllum africanum*	lt. brown	hard	fine	straight to roey	2	2	2	3	West Africa	medium	3
LUPUNA	samauma	*Ceiba samauma*	cream	soft	medium	roey	2	2	3	2	S. America	low	4
MACAWOOD	macacahuba	*Platymiscium pinnatum*	red	very hard	medium	straight to roey	2	2	1	2	Central and S. America	high	2
MADRONE	manzanita	*Arbutus and Arctostaphylos spp.*	reddish brown	medium	fine	straight to irregular	2	2	2	3	Western U.S.	unknown	2 - 3
*MAGNOLIA	cucumber tree	*Magnolia grandiflora and virginiana*	lt. greenish brown	medium	fine	straight	2	2	3	1	Eastern U.S.	medium	3
*MAHOGANY, AFRICAN	acajou d'Afrique (French)	*Khaya spp.*	pale reddish brown	medium	medium	roey	2	1	2	1	West Africa	med. high	2

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*MAHOGANY, GENUINE	acajou (French)	*Swietenia macrophylla*	med. reddish brown	medium	medium	straight to roey	2	1	2	1	Mexico to Nor. S. America	med. high	1
*MAHOGANY, PHILIPPINE (dk. red)	guijo, red lauan, tangile	*Shorea spp.*	med. to dark red	medium	med. to coarse	straight to roey	2	2	2	1	Philippine Islands	medium	2
*MAHOGANY, PHILIPPINE (lt. red)	almon, bagtican, mayapis, white lauan	*Shorea and Parashorea spp.*	light red	medium	coarse	straight to roey	2	2	2	1	Philippine Islands	medium	2
MAKORE	African cherry	*Tieghemella heckelii*	reddish brown	medium	fine	straight to roey	2	2	1	2	West Africa	med. high	2
*MANSONIA	bete, ofun, aprono, African walnut	*Mansonia altissima*	medium to dk. cocoa	medium	medium	straight	2	2	2	1	West Africa	med. high	2
*MAPLE, HARD	sugar maple, (bird's-eye, curly)	*Acer saccharum*	cream	hard	fine	straight (plain maple)	2	2	3	1	Eastern U.S. and Canada	med. high	2
*MAPLE, SOFT	(none in U.S.) (usually includes box elder)	*Acer spp.*	pale tan	medium	medium	straight	2	2	3	1	Eastern U.S., Canada & Pacific N.W.	med. low	3
MARFIM	pau marfim, guatambu	*Balfourodendron riedelianum*	blond	hard	fine	straight	2	2	3	1	Argentina and Brazil	medium	3
MENGKULANG	lumbayau	*Heritiera spp.*	dk. reddish brown	hard	coarse	straight to roey	4	2	3	2	Indonesia and P.I.	medium	3
*MERANTI	seraya (Borneo)	*Shorea spp. (Closely related to Phil. Mahogany)*	2 types - dk. & lt. red	medium	medium coarse	straight to roey	2	2	2	1	Malaysia and Borneo	medium	2
MESQUITE	algaroba	*Prosopis spp.*	light to dark cocoa	hard	medium coarse	straight to roey	2	1	1	3	S.W. U.S. into Nor. S. America	unknown	2
MOABI	African pearwood	*Mimusops djave*	red	hard	fine	roey	2	2	3	2	West Africa	medium	2
MONKEY POD	rain tree, saman	*Pithecolobium saman*	lt. brown, streaked	medium	coarse	straight to roey	2	2	2	3	Hawaii and Latin America	high	1
MORA	nato, petowood	*Mora spp.*	brown	very hard	medium coarse	roey	3	3	1	3	S. America	medium	2
MOVINGUI	ayan	*Distemonanthus benthamianus*	yellow	hard	medium	roey	3	2	2	2	West Africa	medium	3
MUNINGA	Angola padauk	*Pterocarpus angolensis*	golden brown	medium	coarse	roey	2	1	1	3	Africa	high	1
*MYRTLE	bay laurel	*Umbellularia californica*	yel. brown to olive	medium	medium	straight to wavy	1	2 - (hard to kiln dry)	1	1	Calif. into Washington	med. high	1
NIANGON	whismore	*Tarrietia utilis*	reddish brown	medium	coarse	roey	3	3	2	3	West Africa	medium	3
NYATOH	(none in U.S.)	*Palaquium spp.*	lt. brown	hard	fine	roey	2	2	2	2	Malaysia	medium	2
OAK, ENGLISH BROWN	pollard oak	*Quercus robur*	rich brown	hard	medium	irregular	2	2	2	4	England	high	1
*OAK, RED	pin oak, black oak, etc.	*Quercus spp.*	salmon pink	hard	medium open-pored	straight	2	2	3	1	Eastern U.S.	medium	2
*OAK, WHITE	bur oak, post oak, chestnut oak, etc.	*Quercus spp.*	pale tan	hard	medium close-pored	straight	2	2	2	1	Eastern U.S. and Calif.	medium	2
*OBECHE	ayous, samba, African whitewood	*Triplochiton scleroxylon*	off-white to yellow	soft	medium	straight	1	1	3	2	West Africa	medium	2
OKAN	African greenheart	*Cylicodiscus gabunensis*	brown	very hard	medium	roey	3	2	1	3	West Africa	medium	4
OKOKO	yellow sterculia	*Sterculia oblonga*	yellowish brown	hard	coarse	roey	2	3	3	2	West Africa	medium	2
OKURO	albizzia	*Albizzia spp.*	varied pale	medium	medium	straight to roey	2	2	2	3	Africa	medium	2
OLIVE, EAST AFRICAN	musharagi	*Olea hochstetteri*	lt. brown	very hard	fine	roey	2	2	2	3	East Africa	high	2
OLIVE, EUROPEAN	(none in U.S.)	*Olea europea*	yellowish brown	hard	very fine	roey	2	2	2	3	S. Europe, Western U.S.	high	2
ORANGE	citron	*Citrus spp.*	lt. yellow	hard	fine	straight to roey	2	2	3	2	U.S. and others	high	3

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ORIENTAL WOOD	oriental walnut	*Endiandra palmerstonii*	striped dark brown	hard	medium	roey	3	2	2	3	Queensland, Australia	high	2
*PADAUK	vermillion, (narra in P.I.)	*Pterocarpus spp.*	red (some kinds golden)	hard	medium	straight to interlocked	2	1	1	1	West Africa, S.E. Asia	high	1
PAHUTAN	(none in U.S.)	*Mangifera altissima*	dark brown	hard	fine	straight to roey	2	2	2	4	Philippine Islands	high	1
*PALDAO	dao (pronounecd "dow")	*Dracontomelum dao*	lt. brown	medium	medium	straight to roey	2	2	2	3	Philippine Islands	high	1
PALOSAPIS	mersawa	*Anisoptera spp.*	lt. yellowish brown	medium	medium	roey	4	2	3	2	Malaysia and P.I.	medium	2
PARTRIDGE WOOD	acapu	*Voucapoua americana*	striped dark brown	hard	coarse	straight to roey	3	2	1	2	Surinam, Brazil, Guianas	medium	2
PAU AMARELLO	canary wood	*Euxylophora paraensis*	blond	hard	fine	straight to roey	2	2	3	4	Brazil	high	2
PAU FERRO	brown ebony, ironwood	*Caesalpinia spp.*	striped dark brown	very hard	medium	roey	3	2	1	2	Mexico to S. America	high	1
PEAR	(none in U.S.)	*Pyrus communis*	pink	hard	very fine	straight	2	2	3	4	France & U.S.A.	high	2
*PECAN	sweet pecan, bitternut hickory, etc.	*Hicoria spp.*	pale tan	hard	medium	straight	3	1	3	1	Eastern and Southern U.S.	medium	2
PEROBA AMARELLO	West Indian boxwood	*Aspidosperma vargasii*	yellow	hard	fine	straight	1	1	3	2	S. America	high	3
PEROBA, RED	peroba rosa	*Aspidosperma spp.*	yellowish red	hard	very fine	straight to roey	2	2	2	2	Brazil	medium	3
PEROBA, WHITE	peroba de campos	*Paratecoma peroba*	brown	hard	fine	roey	2	2	1	2	Brazil	medium	2
*PERSIMMON	possum wood, date plum, American ebony	*Diospyros virginiana*	sap: tan heart: black	very hard	med. fine	straight	3	2	1	2	Eastern and Southern U.S.	medium	3
PETEREBI	freijo	*Cordia spp.*	med. brown	medium	fine	straight to roey	2	2	2	2	Mexico to South America	high	1 - 2
PINE, CARIBBEAN	(none in U.S.)	*Pinus caribaea*	yellowish brown	hard	medium	straight	2	2	3	3	Central America	medium	4
*PINE, IDAHO WHITE	western white pine	*Pinus monticola*	pale tan	soft	fine	straight	1	1	2	2	Western U.S.	med. high	2
*PINE, NORTHERN WHITE	cork pine	*Pinus strobus*	pale tan	soft	fine	straight	1	1	2	3	Northern U.S., S.E. Canada	med. high	2
PINE, OCOTE	(none in U.S.)	*Pinus ocarpa*	yellowish brown	medium	medium	straight	2	2	3	3	Mexico to Central America	medium	4
*PINE, PARANA	araucaria	*Araucaria angustifolia and araucana*	pale reddish brown	med. soft	fine	straight	1	3	3	1	Latin America	med. low	3
*PINE, PONDEROSA	bull pine, black jack	*Pinus ponderosa*	lt. orangey brown	soft	medium	straight	1	1	3	1	Western U.S.	medium	2
*PINE, SOUTHERN YELLOW	longleaf pine, shortleaf pine, etc.	*Pinus spp.*	pale orangey yellow	medium to hard	coarse	straight	2	2	3	1	Southeastern U.S.	med. low	3
*PINE, SUGAR WHITE	(none in U.S.)	*Pinus lambertiana*	lt. orangey brown	soft	fine	straight	1	1	3	1	Western U.S.	medium	2
PLANE, LONDON	English Sycamore	*Platanus acerifolia*	lt. reddish brown	medium	medium	irregular	2	3	3	4	England	medium	2
PLUM	sloe	*Prunus americana*	reddish brown	medium	fine	straight	2	1	2	4	Northern U.S.	unknown	2
*POPLAR, YELLOW	tulip tree	*Liriodendron tulipifera*	lt. brn. with greenish cast	medium	medium	straight	2	2	3	1	S.E. U.S.A.	medium	2
PRADU	(first cousin to Padauk)	*Pterocarpus spp.*	red	hard	medium	straight to interlocked	2	1	1	2	Thailand	high	1
*PRIMA VERA	white mahogany	*Cybistax donnellsmithii*	creamy white	medium	med. fine	roey	2	1	3	3	Mexico into Northern S.A.	high	1
QUEBRACHO	barauva	*Schinopsis lorentzii*	red	very hard	fine	irregular	3	3	1	2	S. America	medium	3
*RAMIN	melawis	*Gonystylus bancanus*	white	med. hard	fine	straight	2	2	3	1	S.E. Asia	medium	2

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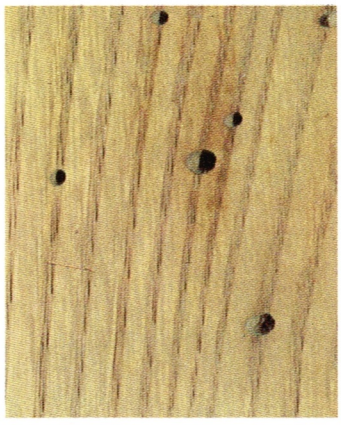


17 Chestnut
Castanea dentata

18 Cocobolo
Dalbergia retusa

19 Cottonwood
Populus spp.

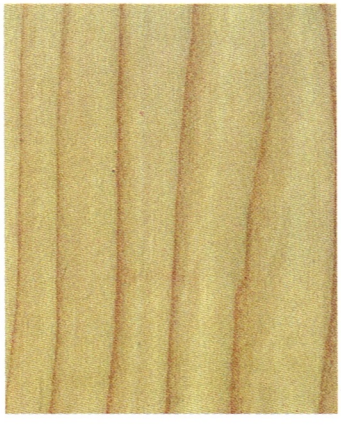
20 Cypress
Taxodium distichum

21 Damar Minyak
Agathis alba

22 Ebony, black
Diospyros spp.

23 Elm, american
Ulmus americana

24 Gum, unselected color
Liquidambar styraciflua



25 Hemlock, western
Tsuga heterophylla

26 Imbuia
Phoebe porosa

27 Koa
Acacia koa

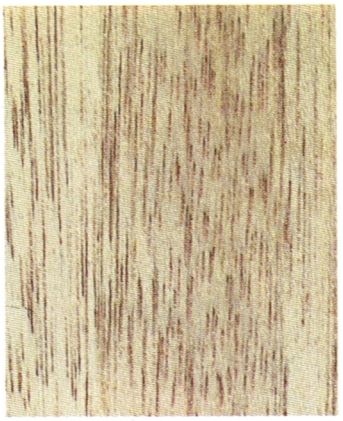
28 Korina®, Limba
Terminalia Superba

29 Magnolia
Magnolia spp.

30 Mahogany, african
Khaya spp.

31 Mahogany, genuine
Swietenia macrophylla

32 Mahogany, philippine dark red
Shorea spp.



33 Mahogany, philippine light red
Shorea spp.

34 Mansonia
Mansonia altissima

35 Maple, hard
Acer saccharum

36 Maple, soft
Acer spp.

37 Oak, plain red
Quercus spp.

38 Oak, rift red
Quercus spp.

39 Oak, plain white
Quercus spp.

40 Obeche
Triplochiton scleroxylon

41 Padauk
Pterocarpus soyauxii

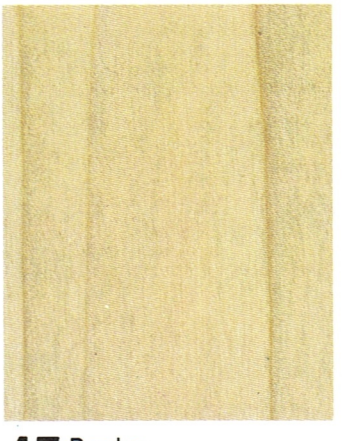
42 Pecan
Hicoria spp. and Carya spp.

43 Pine, parana
Araucaria spp.

44 Pine, ponderosa
Pinus ponderosa

45 Pine, sugar white
Pinus lambertiana

46 Pine, yellow
Pinus spp.



47 Poplar
Liriodendron tulipifera

48 Pradu
Pterocarpus spp.

49 Ramin
Gonystylus spp.

50 Redwood
Sequoia sempervirens

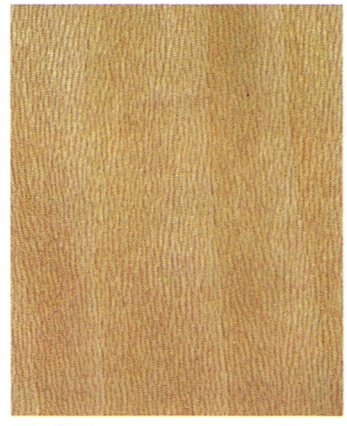
51 Rosewood, brazilian
Dalbergia nigra

52 Rosewood, east indian
Dalbergia latifolia

53 Sassafras
Sassafras albidum

54 Satinwood, ceylon
Chloroxylon swietenia

55 Spruce, sitka
Picea sitchensis



56 Sycamore, american
Platanus occidentalis

57 Teak
Tectona grandis

58 Tulipwood
Dalbergia aff. frutescens

59 Walnut, north american
Juglans nigra

60 Wenge
Millettia laurentti

61 Willow
Salix nigra

62 Zebrawood
Brachystegia spp.

63 Bird's-eye Figure
(hard maple)

64 Burl Figure
(north american walnut)

Common Name	Other Common Name	Botanical Name	Color	Density	Texture	Grain	Ease of Working	Stability Rating	Dura-bility	Availability	Source	Cost	Beauty Rating
*TEAK, GENUINE	(none in U.S.)	*Tectona grandis*	med. brown	hard	coarse	straight to wavy	4	1	1	1	S.E. Asia, India, etc.	high	1
TERENTANG	(none in U.S.)	*Campnosperma spp.*	grayish pink	soft	fine	roey	3	2	3	2	Malaysia	medium	3
THUYA BURL	thyine wood (sandarac tree)	*Callitris quadrivalvis*	reddish tan to dk. brown	soft	coarse	irregular	3	3	2	2 veneers only	Atlas Mtns. of Morocco & Algeria	high	1
TIAMA	edinam	*Entandrophragma angolense*	reddish brown	medium	medium	roey	2	2	2	2	West Africa	medium	3
*TIGERWOOD	lovoawood, Nigerian walnut	*Lovoa klaineana*	grayish to walnut brn.	medium	medium	roey	2	2	3	2	West Africa	med. high	2
TULIPWOOD	pau rosa (rosewood group)	*Dalbergia aff. frutescens*	striped yel. & red	very hard	medium	straight to roey	3	2	3	2	Brazil	high	1
TUPELO	bay poplar	*Nyssa aquatica*	pale yellowish brown	medium	fine	irregular	2	3	3	1-usually mixed w/blk. gum	S.E. U.S.	med. low	3
ULCUMANO	manio	*Podocarpus spp.*	lt. yellow	soft to medium	medium fine	straight	1	2	3	2	Central and S. America	medium	3
UTILE	sipo	*Entandrophragma utile*	reddish brown	medium	coarse	roey	2	3	2	2	West Africa	medium	2
*VIROLA (also see banak)	otobo, cuangare	*Dialyanthera otoba and gordonifolia*	lt. pinkish brown	soft	medium	straight	1	2	3	1	Central America & Venezuela	med. low	3
*WALNUT, CLARO	California walnut	*Juglans regia*	lt. brown	medium	fine	straight	2	2	2	4 veneers only	California, U.S.A.	high	1
*WALNUT, NORTH AMERICAN	black walnut	*Juglans nigra*	dk. brown	med. hard	medium	straight to irregular	2	1	1	1	Eastern U.S.A.	high	1
*WALNUT, PERSIAN	(see Persian walnut story)	*Juglans regia*	med. brown	medium	coarse	straight to wavy	2	1	1	3	Europe and Mideast	high	1
*WALNUT, SOUTH AMERICAN	nogal (Spanish)	*Juglans spp.*	dk. brown	medium	coarse	straight	2	2	2	1	Northern S. America	high	2
WENGE	panga panga, dikela	*Milletia laurentii*	striped dk. brn. to blk.	hard	coarse	straight	2	2	1	2	West African Congo	high	1
*WILLOW	(none in U.S.)	*Salix nigra*	varied lt. tan to dk. brown	soft	coarse	straight	2	2	1	1	Eastern U.S.	med. low	3
YEW, EUROPEAN & CAUCASIAN	(a bow wood)	*Taxus baccata*	orange brown	med. hard	fine	straight	2	2	3	3	Europe, Japan, N. Africa	high	2
ZAPOTA	chicle tree	*Achras zapota*	reddish brown	very hard	fine	straight	3	2	1	2	Mexico to S. America	medium	3
*ZEBRAWOOD	zebrano, zingana	*Brachystegia spp.*	striped pale brown	hard	medium	roey	2	2	2	1	West Africa	high	1

*Woods marked with asterisk are also included in stories about woods, which follow the charts.

LITTLE STORIES

About some of our better-known woods

IMPORTANT NOTE: More facts about all of the woods appearing in the following 28 pages may be found in the data charts which precede this section. Please consult the woods index (pages 1, 2 & 3) for page number.

AFRORMOSIA

Genus: PERICOPSIS; Principal species: *elata*

FROM GHANA AND CONGO REPUBLICS. In some markets it is known as kokrodua, and is sometimes referred to as "African teak," although not related to genuine teak.

The wood is hard, heavy and strong, similar to teak in most technical properties. Not especially difficult to work, considering its density. Unlike teak, afrormosia can be glued successfully employing ordinary techniques.

Afrormosia also looks quite a lot like teak, as it is similiar in color, texture and graining. It is a beautiful cabinet and furniture wood of the first class. Not well known in the United States, but admired by all to whom it is familiar. Some of the "teak" furniture imported from Scandinavian countries is actually afrormosia.

Afrormosia does not contain the heavy concentration of silicates and minerals characteristic of genuine teak, and for this reason is not suggested as a substitute for teak in critical marine work.

RED ALDER

Genus: ALNUS. Principal lumber species: *rubra.*

GENERAL CHARACTERISTICS: Light weight for a hardwood but very fine texture with relatively good impact resistance. Tree deciduous, wood diffuse porous, contrast in spring and summer wood not apparent. Heartwood pale roseate, luster low; sapwood lighter. Fine machining and finishing characteristics, stains easily to blend with more expensive woods.

This birch relative is found from Alaska to southern California, but its commercial range is limited mainly to moist situations in western Oregon and Washington.

Red alder is a good utility furniture wood. Exposed parts of alder are usually stained to blend with walnut, mahogany or cherry veneers. It is highly prized for upholstery framing because of its stability and superior tack holding capability.

The wood is not widely used east of the Rockies, heavy shipping costs making it noncompetitive with woods that are native to midwestern and eastern U.S. and offer similar utilitarian value. Red alder is very popular in western markets, and deservedly so.

AMBURANA

Genus: AMBURANA. Species: *cearensis*

A medium-size timber widely distributed in the dry regions of Brazil and northern Argentina. It is admired in both countries as a fine furniture wood. All parts of the tree smell like coumarin, a pleasing odor strongly reminiscent of vanilla; the seeds and bark resins are used in perfumery and medicinally.

The wood is yellowish or very light brown with a slight orange hue. Vessel lines are conspicuous and of varied size. Texture is somewhat coarse but uniform. Luster is medium to high in good light and this is a hallmark of all ranking cabinet woods.

Amburana dries, glues, works and finishes beautifully. It rates well in dimensional stability, stays put and is fairly durable. Weight and hardness are similar to the mahoganies.

It's an interesting addition for any lover of great decorative woods.

ANDIROBA

Genus: CARAPA. Principal lumber species: *guianensis*. Other common names include "crabwood" and "cedro macho."

FROM CENTRAL AMERICA, the GUIANAS, AMAZONIAN BRAZIL AND EASTERN PERU.

The tree is an evergreen of better than average size. Besides providing valuable lumber, its seeds are used in soapmaking.

Andiroba is pinkish to dark red when freshly cut, darkening to a uniformly reddish brown color upon exposure. It machines well and finishes easily to nearly any desired color.

The wood compares favorably with walnut in hardness and strength. It is rated as very durable in difficult situations, thus should be suitable for boat building.

Important quantities of andiroba are being consumed in the manufacture of furniture in the United States. It is also suitable for millwork, cabinetry and plywood, as a ranking decorative wood.

APITONG

Genus: DIPTEROCARPUS. Species: grandiflorus. (Note: A number of species are often sold as "apitong.")

GENERAL CHARACTERISTICS: Heavy, hard and tough. Rather coarse grain. Due to mineral content, tends to dull cutting edges of ordinary tool steel. Diffuse porous. Heartwood extraordinarily durable. Color of heartwood: moderately dark brownish red.

In the Philippines, apitong is a useful structural and utility wood. Its chief virtues are its durability in places where other woods would rapidly decay, and its remarkable resistance to abrasive wear. Here in the United States, apitong has served with unusual success in many difficult spots. Among these are: truck flooring, skids, laundry machine tubs, and other rigorous uses. Please notice that all these require a strong, tough, durable and wear-resistant material.

It is suitable for structural parts in boats, but the wood itself is not waterproof, so should not be used for planking.

Apitong is closely related to philippine mahogany, but does not finish as well, due to the coarser fiber and grain structure.

This wood also grows in other parts of the far East, where it is known by other common names, e.g., in Malayia "keruing," in Thailand "yang." That from Occidental Negros in the Philippines is said to be the best.

ASH

Genus: FRAXINUS. Principal lumber species: *americana* (white ash); *nigra* (black ash); *pennsylvanica* (red ash); and *lanceolata* (green ash). N.B. Some authorities regard lanceolata as only a variant of pennsylvanica, and list the two accordingly.

GENERAL CHARACTERISTICS: Heavy, hard, strong and tough. Machines and bends well. Tree is deciduous; wood is ring porous, with spring and summer wood strongly contrasted. Color: white ash lumber, white to off-white toward tan; brown ash, light brown or tan.

The ash belongs to the Olive family, although its only fruit is a dart-like winged seed. There are about 70 species of the genus, counting shrubs as well as trees. These are found, always growing with other trees, in the northern hemisphere only, including most sections except extremely cold areas.

Of the eighteen species native to the United States, those listed in the heading supply possibly 98 per cent of our ash lumber, a number of other species furnish the other two per cent.

White ash is the best known of the lot and the most useful. Its wood is hard and heavy, strong in comparison to weight, and able to resist a succession of shocks that would destroy some other woods of equal or greater density. Thus it is used with success as ball bats, hockey sticks, tool handles, agricultural implements, oars and the like. It is tasteless and has been popular for food containers.

In the lumber trade, the toughest stock is segregated and marketed as "tough white ash," while softer-textured material, often from the same tree, is sold for furniture and like purposes. Ash is a popular wood for kitchen furniture.

White ash, green ash and red ash are all sold as "white ash" in the lumber trade. The wood marketed as northern brown ash, or brown cabinet ash is Fraxinus nigra, the black ash. Its grain is similar to that of all ash lumber, but the color is a definite light brown or tan, and the figure is considered more beautiful in furniture, fixtures and wall paneling than is white ash.

All ash lumber is noted for stability. It is less subject to twist, warp and dimensional change than most of our native hardwoods.

ASPEN

Genus: POPULUS. Principal lumber species: *tremuloides*. (A separate species, grandidentata, is found in northeastern United States and southeastern Canada. Tremuloides is found all over the U.S. except in extreme southeast and in gulf states.)

The aspen is so closely related to the tree most of us know as cottonwood that it is botanically in the same genus (see cottonwood). It is sometimes called popple.

The woods of the two species named above are practically identical; both are distinguished from cottonwood by finer texture and higher luster.

Aspen is an important pulpwood, supplying much of our book paper. As lumber, it is almost entirely a utilitarian material. Only about 2% of the aspen stand grows to timber size, so that the best aspen lumber tends to narrow width average. The wood is light in both color and weight, without distinctive grain or figure, and lacks the characteristics generally regarded as decorative.

BALSA

Genus: OCHROMA. Principal lumber species: *lagopus.*

Most of the balsa wood distributed here is from Ecuador, and it is an important item of export to that country. It is most commonly seen in miniature aircraft and similar novelties, but is suitable for insulation of limited areas, and is a good sound deadener. Other uses include life rafts, duck decoys, protective packing for furniture, hat blocks, etc.

The pale tan wood is one of the lightest known, weighing from .6 to 1 lb. per board foot, when dry.

BANAK

Genus: VIROLA. Principal lumber species: in Central America, *koschnyi;* in northern South America, *sebifera* and *surinamensis.* (A related wood is sold in the United States as virola. Please see explanation under that name.)

A large volume of banak is entering the United States, where it is used largely in the production of wood mouldings, although it is an excellent utility hardwood for many purposes.

The wood is light pinkish-brown with medium to high luster. It is generally straight-grained, easy to work, glues without difficulty and holds nails well. It will accept fine finishes readily, presenting a handsome if rather plain appearance.

Banak is too soft for some end uses, weighing only about 2.5 lbs. per board foot in the rough, kiln dried. It is not durable in situations favoring decay, but it is available at reasonable cost and is well suited for many projects ordinarily associated with such woods as our western pines.

BASSWOOD

Genus: TILIA. Principal lumber species: *glabra* (Northern Basswood); and *heterophylla* (Southern Basswood).

GENERAL CHARACTERISTICS: One of the softest hardwoods in regular commercial use. Noted for fine, even grain and exceptional stability. Tree is deciduous; wood diffuse porous, with little contrast between spring and summer wood. Color of heartwood very light brown, sapwood nearly white. Good machining and sanding characteristics.

Basswood is sometimes called linn and is a member of the linden family. For some rather technical uses, few woods are as satisfactory. These include venetian blinds, beehives and honey sections, drawing boards, picture frame mouldings, woodenware, toys, wood novelties and other objects requiring a clean looking, attractive wood of light weight and color. It is suitable for food containers, as it is odorless and tasteless.

Basswood is found to some extent throughout the eastern United States, with half of the stand of timber in the Lake Superior region. Northern basswood lumber is thought to offer some advantages over southern stock in soft, even texture and relative freedom from stresses, probably because of slower growth.

BEECH

Genus: FAGUS. Principal lumber species: One only in United States and Canada: *grandifolia.*

GENERAL CHARACTERISTICS: Heavy, hard and strong. Good resistance to abrasive wear. A good substitute for hard maple, although darker in color and slightly coarser in texture. Machines cleanly, responds well to abrasives and is of medium luster; can be finished to compare favorably with more expensive woods. Tree deciduous; wood diffuse porous. Color of heartwood pale brown to rich reddish brown, sapwood lighter, usually distinct. No strong contrast in spring and summer wood. Odorless and tasteless.

Nature has spared us the confused nomenclature associated with most woods, and at the same time taken a great deal of interest from the beech by providing us in America with only one species. There are only seven or eight species in the world, and the wood of all is similar. Related to the oak and chestnut, beech grows in the eastern one-third of the United States and adjacent Canadian provinces, with the greatest production in the Central and Middle Atlantic states. It is also a useful and popular wood in Europe and in Japan.

Some users aver that beech from the north machines and finishes more beautifully than that from the south. This is open to question, but if there is any difference, it is small, and is due to different soil and climate.

Principal among the uses for beech are: flooring, furniture (especially adaptable and correct for provincial styles), crates, boxes, millwork, turnings, scrub brush backs and handles, laundry appliances, food containers. As flooring, beech is valuable for its ability to withstand heavy foot traffic. It is a good alternate to hard maple for this and similar uses, at a lower price. It accepts a variety of stains attractively and is well suited to lacquer or varnish finishes of good quality.

BIRCH

Genus: BETULA. Principal lumber species: *lutea* (yellow birch); *lenta* (sweet, black, or cherry birch); and *papyrifera* (paper, canoe, or white birch).

GENERAL CHARACTERISTICS: Moderately heavy, hard and strong. Excellent machining and finishing characteristics. Tree deciduous; wood diffuse porous, with little contrast between spring and summer wood, although annual growth is well marked. Heartwood reddish brown, sapwood yellowish white with a trace of pink.

Growing in southeastern Canada, the Lake States, New England and the Appalachian region as far south as Georgia, yellow birch is the most important commercially of the birches. The sweet birch is found from Newfoundland and Ontario through New England to the southern Appalachians. It is a little denser and deeper in color than yellow birch, although, where cut together, the two are sold simply as birch.

When considering birch as a decorative wood, the paper birch should be disregarded entirely. It grows in much the same range as sweet birch, with the commercial center in Maine. Paper birch is valuable for the sapwood, which constitutes the greater part of the tree of moderate size, and is ideally suited for turnery. Moderately hard, uniform in texture and fine grained, it is one of our best woods for dowels, spools, bobbins, handles, etc. Other uses include toothpicks, clothespins and shoepegs.

Birch is especially popular for furniture, fixtures, fine cabinets, flooring, doors and interior trim. Although sometimes available as "selected white birch" (all sapwood one face), and "selected red birch" (all heartwood one face), the majority of users prefer unselected birch, which contains portions each of heartwood and sapwood.

In addition to its usefulness as lumber, birch is the most popular of the decorative woods of value in plywood form. Vast quantities of birch plywood are consumed every year, much of it is imported from Japan. Japanese birch plywood is faced with Japanese birch veneer, which is indistinguishable from American birch.

BUBINGA

Genus: Several species of Guibourtia

This is a hard, heavy wood from West Africa with some of the characteristics of rosewood, to which it is said to be distantly related. The overall color, after some exposure, is a deep, opulent looking red, sometimes with a purplish cast and usually displaying fine, evenly spaced lines of darker hue. It is seldom seen in the United States, but has been employed both as a cabinet wood and as a decorative plywood. Bubinga is closely related to benge, another rare and beautiful wood.

BUTTERNUT

Genus: JUGLANS. Only lumber species: *cinerea*.

GENERAL CHARACTERISTICS: Relatively soft and weak. Texture rather coarse, but wood polishes to high luster. Easy to work; machines, turns and sands well. Tree is deciduous; wood ring porous. Color of heartwood light brown or fawn; sapwood lighter.

Butternut is a true member of the walnut family. It is better known for the edible nuts than as lumber. The tree is of sparse occurrence from southern New Brunswick and Maine through the upper peninsula of Michigan to eastern South Dakota, then southward into Northern Arkansas and the mountains of Alabama and Georgia.

When growing in open places, the trunk is short, branching out only a little way above the ground. Occasional forest trees in protected places may reach heights of one hundred feet and diameters of four feet, but such individuals are rare. Butternut is scarce and the supply is rapidly diminishing. The tree is short lived; the widely branched crown weak and susceptible to breakage by storms or heavy loads of snow, exposing it to the attacks of insects and fungus diseases.

The wood of butternut, sometimes called white walnut, closely resembles that of the black walnut, its close relative, but is much softer, lighter in color. It is a good cabinet wood, although too weak for some purposes. It has been used for interior trim, boat trim, interior cabinets and the like. In some situations, it is more desirable for wall paneling than black walnut, due to the lighter, more cheerful color.

AROMATIC RED CEDAR

Genus: JUNIPERUS. Principal lumber species: *virginiana*.

GENERAL CHARACTERISTICS: Of medium density for one of the softwood group. Good machining qualities. Tree is evergreen; wood non-porous, close grained and durable. Pleasingly and lastingly aromatic. Heartwood red; sapwood white.

The wood we know as red cedar, aromatic cedar, etc., is really not a cedar at all. It is a juniper, belonging to the true cypress family,

which incidentally, does not include the wood we call cypress. Red cedar is cut from small timber, mostly second growth. The lumber is therefore of small width and length average, is very knotty and contains a great deal of the white sapwood. It is useless in buying this wood to ask for clear lumber, all red heartwood or wide widths.

Aromatic cedar possesses an unique charm, and has endeared itself to millions who are the proud owners of a handsome cedar chest or a cedar lined closet. Except for novelty furniture and wall paneling, these are almost the only uses for the wood in lumber form. Some of it goes into pencil slats, and the sawdust is distilled for the aromatic oils.

The aroma from cedar wood is reputed to inhibit the growth of moths, and there is little doubt of its efficacy so long as the odor is strong. For the utmost in moth protection over a long period of years, every care should be taken to make the chest or closet as nearly air tight as possible.

Although most of the aromatic cedar in the United States is Juniperus virginiana, some lumber is produced from a separate species growing in Florida and southern Georgia, Juniperus lucayana, whose range extends into the West Indies.

SPANISH CEDAR

Genus: CEDRELA. Principal lumber species: *odorata*.

Not a great quantity of this wood is consumed in the United States, but it is the most important timber for domestic use in tropical America. It has all the properties of a wood of value, easy to work, dries without warping or splitting, strong in proportion to weight, good stability, excellent durability and handsome appearance.

The wood resembles Swietenia mahogany, to which it is closely related, but is darker and a more definite brownish red in color, and is characterized by fine, dark lines. The one fault which prevents more widespread use in our country is the presence of too much gum, which has the tendency of clouding the surface when fine finishes are applied to it.

At one time, most cigar boxes were made of spanish cedar. It was thought the volatile oils it contains added a desirable aroma to the tobacco. This practice, however, has practically been discontinued. No one who has sampled the fragrance of the wood can ever forget it; spanish cedar is delightfully aromatic.

THE CEDARS

Genus: CHAMAECYPARIS and THUJA. Principal lumber species: C. *thyoides* (southern white cedar); C. *nootkatensis* (Alaska or yellow cedar); C. *lawsoniana* (Port Orford cedar), T. *plicata* (western red cedar); and T. *occidentalis* (northern white cedar).

General Characteristics: Included in description. These cedars have one thing in common; they are all conifers belonging to the cypress family.

Southern White Cedar is found in the Atlantic and Gulf coastal swamps from southern Maine to southern Florida and southwestern Louisiana. It is light, soft and mildly fragrant. The straight grained, even-textured wood is easy to work and very durable. It weighs slightly less than two pounds per board foot when dry. The heartwood is pale brown with a pinkish tinge. As lumber, it is used principally for boat planking, tank staves, shingles, woodenware and general millwork.

Alaskan or **Yellow Cedar** is a rather large tree, up to six feet in diameter and 120 feet high. It is of scattered occurrence from southwestern Alaska to northern California, reaching its best development in British Columbia. This wood seldom is seen in American markets, the consumption being largely local, where it is used for furniture, interior millwork and in small boat construction. The heartwood is pale off-white to yellow, the scent faint but unattractive. Like other cedars, the wood is light, straight grained, easy to work and durable.

Port Orford Cedar is a timber species of considerable importance. It matures to large size, up to seven feet in diameter, and 174 feet high, with occasional old trees considerably larger than this.

The range of the species is limited; confined to a strip one to forty miles wide from Coos Bay, Oregon to Eureka, California, usually found growing with other species.

The lustrous, pale yellow wood is straight grained, of fine and even texture, and has a penetrating, although pleasant, scent. It is strong for its weight: approximately 2.8 lbs. per board foot, dry. Easy to season, it machines to exceptional smoothness and is well adapted to fine paint and enamel finishes.

Western Red Cedar is known to all. It is the leading shingle wood of the United States and is ideally adapted to that purpose. It is light in weight, remarkably durable under exposure to rain and sun; heat and cold. The wood stains well for exterior purposes; machines and seasons readily.

The name Thuja plicata is derived from Latin and Greek; meaning a tree having wood of aromatic fragrance and whose leaves are folded or plaited. It grows in a belt along the coast from southern Alaska to northern California, and in this country, extending across northern Washington to western Montana. Average mature trees are six to eight feet in diameter and 150 feet tall. The heartwood is reddish brown when freshly cut; oxidizing to dull brown upon exposure. Air dried wood weighs about two pounds per board foot.

It is variously estimated that fifty to seventy per cent of the timber cut is processed into shingles. Other uses include exterior millwork and exterior construction of all types where durability is more important than strength. Sash and doors, tanks, small boats, greenhouse sash and trays and interior trim are also manufactured from western red cedar, while small trees are cut for poles and fence posts.

Northern White Cedar, Thuja occidentalis, is more plentiful in Canada than in the United States. Favoring swampy ground, it is found in the Lake States, eastward to the Atlantic Coast as far south as New Jersey, and down the Appalachians through North Carolina and Tennessee. The timber is used largely in the round for poles, fences and street railway cross-ties. Some lumber is sawed; used largely for inexpensive, local construction. The wood is faintly aromatic, light in weight and pale yellow-brown in color; very knotty. It is used for ornamental plantings, usually known in that form as arbor vitae.

CHERRY

Genus: PRUNUS. Only lumber species: *serotina.*

GENERAL CHARACTERISTICS: Moderately heavy and hard, strong. Machines and sands to glasslike smoothness. Tree is deciduous; wood diffuse porous, close grained; annual growth visible but not pronounced; exceptional stability. Heartwood reddish brown, sometimes with greenish cast; sapwood yellowish.

Like all our fruit trees, cherry belongs to the rose family. Prunus serotina is a small, scrubby tree in poor situations but in the rich, moist soil of the Appalachian regions it may reach a height of 100 feet or more, with diameters of four to five feet.

Many connoisseurs of fine cabinet woods regard cherry as of top value as a furniture species, ranking in this country second only to walnut.

The uses of cherry are those of any fine cabinet wood, limited now because of its relative scarcity. The fine large timber once available has largely been cut, so that cherry lumber of top quality is practically unobtainable and the woodworker must face the necessity of careful fabrication to dispose of knots and other defects. Cherry lumber has one outstanding industrial use: it is a valuable stereotype or electrotype wood, its unusual stability making it desirable for that purpose.

The wood from any of our fruit trees is sometimes called "fruitwood." As a rule this term refers to cherry.

CHESTNUT

Genus: CASTANEA. Principal lumber species: *dentata.*

GENERAL CHARACTERISTICS: A hardwood of low density, coarse-textured and very durable. Machines easily; stays in place well. Tree is deciduous; wood ring porous; annual growth rings prominent; open grained.

At one time, chestnut was one of the important timber trees of the Appalachian region. As a result of the chestnut blight, a parasitic fungus, the chestnut of the United States has been almost entirely destroyed. The remaining timber has been standing dead for several decades, consequently is all quite wormy.

The wood is still used for wall paneling, chests, etc., where a distinctly rustic effect is desired. It is a good material for plywood core stock, and at one time was widely employed in interior trim, furniture, shingles, fence posts, railway cross-ties and poles. It is one of the most durable of our native hardwoods.

COCOBOLO

Genus: DALBERGIA. Principal lumber species: *retusa.*

Technically one of the genuine rosewoods, cocobolo is imported from Panama, western Costa Rica and Nicaragua. Only the heartwood is used; the dirty-white sapwood is hewed away while the logs are still in the forest.

Freshly cut, cocobolo heartwood is rainbow hued, with red the predominating color. Upon exposure, the wood darkens to deep red, with black markings. It is very dense, hard and oily. Cocobolo was once widely used for knife handles in the cutlery trade, but has been largely replaced by modern plastics. Uses now are mostly confined to small decorative pieces, boxes, furniture accessories and the like.

COTTONWOOD

Genus: POPULUS. Principal lumber species: *deltoides* (eastern cottonwood); *heterophylla* (swamp or river cottonwood); *trichocarpa* (black cottonwood); and *balsamifera* (balsam poplar or Balm of Gilead).

GENERAL CHARACTERISTICS: Soft and light in weight. Tree is deciduous; wood diffuse porous, close-grained, coarse in texture, difficult to split. Machines easily but contains mineral which dulls cutting edges to some extent. Low in luster; finishing characteristics poor. Color of heartwood very light brown, often with grayish cast; sapwood lighter. Annual growth rings inconspicuous; wood is nondescript as to figure.

Eastern cottonwood is of scattered distribution over the entire eastern half of the United States. Swamp or river cottonwood grows most abundantly in the South Atlantic and Gulf regions in the Mississippi Valley. Black cottonwood is the largest deciduous tree of the West Coast, growing from southern Alaska to southern California. It is sometimes called western poplar. The balsam poplar or balm of gilead is found in Canada and Alaska, and along the northern border of the United States.

Cottonwood is used principally for boxes and crates, where light weight and color, resistance to splitting and freedom from taste and odor are important. Other uses are planing mill products, woodenware, plywood, excelsior and pulp. Cottonwood has practically no desirable finishing characteristics and is not suitable for fine cabinet work.

Cottonwoods are members of the true poplar family, which is a branch of the willow family. The tree producing lumber we know as "yellow poplar" is in reality a magnolia. The cottonwood group includes the aspens and popples. (see aspen).

CYPRESS

Genus: TAXODIUM. Principal lumber species: *distichum*.

GENERAL CHARACTERISTICS: Light in weight and soft; easily worked. Tree is deciduous; wood rather coarse in texture, non-porous, annual growth clearly defined. Color of heartwood: deep swamp or yellow cypress light orange brown; tidewater cypress darker and redder. Heartwood of cypress, and particularly the tidewater cypress, has a world-wide reputation for durability.

N.B. All comment concerning durability refers to heartwood only.

Bald cypress, the common name of this tree, is not a true cypress, but belongs to a family known to botanists as Taxodiaceae, which includes redwood. It grows in swamps and along streams from southern New Jersey to Texas in a wide coastal strip, and up the Mississippi valley to southern Indiana and Illinois. The most valuable timber is that cut in the gulf swamps close to the sea. This is sold as tidewater red cypress. Cypress cut from other swampy areas is marketed as yellow cypress.

The characteristic which sets cypress apart from most other American woods is its outstanding durability upon exposure. The wood is easy to work, but requires care in seasoning to prevent hair line checking. It is suitable for exterior parts of buildings and is excellent for water tanks, small boats, etc. It makes excellent siding and shingles. Cypress is run to millwork and planing mill products of all kinds, particularly in the localities producing it. It is a good cabinet wood, somewhat weak for furniture, but attractive as wall paneling.

Trees over 200 years old are subject to the attack of a fungus which tunnels into the heartwood, creating a condition known as "peck." The pecky defect has the appearance of having been caused by a large insect, even the residue remaining in the holes contributing to that effect. The fungus dies as soon as the tree is cut, so that the wood is as durable as any cypress, although not as strong. Pecky cypress is widely used for greenhouse benches, as it seems to be unaffected by soil organisms. It is sometimes employed for rustic wall paneling and for other novelty effects.

DAMAR MINYAK

Genus: AGATHIS. Principal lumber species in Malaysia: *alba*. It is identical to the Philippine Alamciga, which is also Agathis alba; and similar to the Kauri Pine of Australia and New Guinea's West Irian (Agathis australis).

This is the only true conifer of commercial importance found in southeastern Asia, thus it belongs to the softwood group . . . is not a hardwood. Supplies are limited to moderate.

An interesting feature of Damar Minyak is its striking superficial resemblance to North American birch, giving rise to such fanciful commercial names as "Polynesian Birch."

Damar Minyak weighs about 2.3 lbs. per board foot in the rough, kiln dried, very much like our western pines in density and strength. It machines and carves unusually well, allowing sharp corners, finishes easily and is dependably stable. It is an excellent softwood both for its technical qualities and for its fine appearance.

DOGWOOD

Genus: CORNUS. Principal lumber species: *florida*.

Included here only as a curiosity; flowering dogwood grows wild only in our country; is famous for the beauty of its blossoms, which literally cover the tree from March to May.

The little tree is so beautiful in all seasons that it is an esthetic crime to cut it for its handful of wood. The wood is so valuable for bobbins and shuttles in the textile industries, however, that the tree is in danger of being exterminated in some areas. It finishes and wears so smoothly, and is so strong and tough for its weight, that nothing else seems to do the jobs mentioned as well. Dogwood is white to pinkish white; only the sapwood is used.

EBONY

Several species of Diospyros.

The several species of Diospyros, growing under a variety of conditions and in many localities, provide ebony wood of a number of colors. We have macassar ebony from the East Indies, which, on a dull black background, displays a startling array of many-hued stripes, which may be dark brown, gray, brownish orange, etc. Ebonies from Gabon, Central West Africa, and from Ceylon are solid black. All the woods sold as ebony are extremely hard and much too dense to float in water. The wood is from small trees, inclined to be defective and in pieces of any size, is likely to develop checking after the project is finished. We consider ebony suitable for inlays, marquetry, small articles of turnery such as decorative handles, etc. A very difficult wood to work.

ELM

Genus: ULMUS. Principal lumber species: *fulva* (slippery elm or red elm); *racemosa* (rock, cork or hickory elm); *americana* (American or white elm).

GENERAL CHARACTERISTICS: Although of only medium density, elm wood is strong and tough for its weight, elastic and shock resistant. Texture rather coarse, but machines readily and bends well. Medium luster, open pores, annual growth clearly defined. Tree is deciduous; wood ring porous. Good finishing characteristics; stains and fills well. Color of heartwood pale brown, occasionally dark brown. In fulva, wood is light and has a grayish cast.

The most important elm species by far is americana, the common white elm. It is known in parks and along streets in most cities from the Middlewest eastward, seemingly unmindful of the soot, fumes and pavement of the city, but in recent years subject to attack of a malady commonly known as "Dutch Elm Disease."

The wood is used in the slack cooperage industry for staves, heading and hoops. It is employed in the manufacture of baskets, especially for rims and bent handles. Other uses are: vehicle parts and frames, agricultural implements, and special types of furniture. It is used to some extent in plywood and for other purposes requiring a decorative wood.

The wood of Ulmus fulva, commonly known as slippery elm or red elm, is marketed as northern gray elm. It is the best of the elms for cabinet work, due to softer and more even texture, light and reasonably uniform color.

Rock elm is denser, harder and more shock resistant than other elm species cut to lumber. It is used chiefly for industrial purposes requiring these qualities.

DOUGLAS FIR

Genus: PSEUDOTSUGA. Principal lumber species: *taxifolia*.

GENERAL CHARACTERISTICS: Soft, coarse-textured, easily worked. It is the strongest of all American woods in comparison to weight. Tree is evergreen; wood non-porous. Annual growth rings clearly marked, usually with strong contrast in density of spring and summer wood. Luster low. Color of heartwood varies with conditions of growth, from pinkish yellow to reddish brown; sapwood lighter.

Douglas fir is one of our most valuable timber trees. The following quotation from "Timbers of the New World" by Record and Hess of the Yale University School of Forestry, is of interest:

> "Douglas fir is extensively distributed along the Pacific coast from British Columbia to central California and inland through the Rocky Mountains into northern Mexico, a range of more than 2000 miles north and south and almost 1000 miles east and west. Two forms of the tree are recognized, the Pacific Coast and the Rocky Mountain, which at their extremes exhibit such differences in the form of the tree, characters of the foliage and cones, and quality of the wood that they would be considered distinct species except that in portions of their range they intergrade and lose their identity."

The interior form, generally speaking, produces smaller timber, the wood is harder, red in color, inclined to be cross-grained and knotty, but durable. Some clear lumber is produced, but it is used mostly for timbers and cross-ties.

The coast type is a large timber up to 325 feet in height and 17 feet in diameter. It supplies most of the lumber known to the trade as

Douglas fir (sometimes called Oregon pine or "Oregon" in the export trade).

The size of the timber permits the manufacture of vast quantities of lumber in a variety of grades adaptable to a wide range of requirements. The best logs go into veneers, and are the source of Douglas fir plywood, one of the most important commodities of the lumber business, a utility material of countless uses.

Principal among the uses of Douglas fir lumber are: wood construction of all types, planing mill products including doors, sash, interior trim, flooring and ceiling, mouldings. Clear heart grades are used in the construction of tanks and similar items. Large timbers can be obtained for heavy construction.

Inland California Douglas fir of mountainous growth is inclined to be of softer and more even growth than coastal stock, and is redder in color. It is sometimes offered as soft-textured California red fir.

WHITE FIR

Genus: ABIES. Principal lumber species: *concolor* (white fir); *grandis* (grand fir); *magnifica* (red fir).

GENERAL CHARACTERISTICS: Soft, light in weight, low in density; rather brittle. Machining properties good; texture fine to moderately coarse. Tree is evergreen; wood non-porous. Color nearly white or with pale tannish cast.

A number of species of true firs, including those shown above, are marketed together as white fir. These trees are found throughout the forests of the Pacific slope and in the Rocky Mountains. Much of the lumber is marketed locally, where it is used in residences and other light construction, and in the production of boxes and crates.

Select, shop and construction grades find their way into other markets. The wood machines and sands well, and will receive acceptable enamel and paint finishes. Thus, it is a satisfactory material for trim, kitchen cabinets and the like. In strength, it compares favorably with spruce and ponderosa pine; construction grades are used for light framing.

GONCALO ALVES

Genus: ASTRONIUM. Principal lumber species: *fraxinifolium*.

This tree is related to the smoke tree sometimes seen in gardens, and owns to a black sheep in the same family: poison ivy. It grows from southern Mexico through tropical South America, but is most abundant and of greatest commercial importance in eastern Brazil. It is known here as goncalo alves, and is regarded as a furniture and cabinet wood of good possibilities. Locally, it is highly esteemed for fine furniture.

There is considerable variation in different specimens, but in general the wood is of moderate density, not too difficult to work, takes a high polish and cuts to veneers well. The color ranges from light to dark brown, sometimes reddish, and exhibiting vertical bands or stripes, often almost black and of variable spacing. The effect is striking and often extraordinarily attractive.

GUANACASTE

Genus: ENTEROLOBIUM. Principal lumber species: *cyclocarpum*.

Also called jenisero, genizero and kelobra. An attractive furniture wood, and also makes handsome plywood. The color is brown with various shadings, sometimes with a reddish cast. It is often well-figured and prominently grained, the latter frequently wavy and having the appearance of being interlocked. It is easy to work, stable and is susceptible of receiving high type finishes. Guanacaste comes from the tropical forests of Central and Northern South America.

RED GUM

Genus: LIQUIDAMBAR. Only lumber species: *styraciflua*.

GENERAL CHARACTERISTICS: Moderately hard and strong. Tree is deciduous; wood diffuse porous, close grained. Machines cleanly and finishes well; stability only fair. Heartwood brown or reddish brown, sometimes beautifully figured with dark, pigmented markings. Sapwood a rather nondescript off-white.

Red gum, also called sweet gum, is one of the most important timber trees of the southern United States. It is a striking example of the change brought about by advances in technology. Seventy-five years ago the sweet gum was regarded as of little or no value, due to the difficulty of seasoning it. Now more gum is processed into furniture than almost any other wood, and it is employed in a host of other useful ways.

This species is exceptional in the wide band of sapwood the trunk produces in proportion to its total mass. It follows that only mature trees have any heartwood at all, and only very large

specimens can produce the clear, selected red wood favored by woodworkers. Red gum of selected color is still to be had, but, in general, the user must be content with stock which must be processed to dispose of knots and other imperfections.

Sap gum is not, as the name would imply, all sapwood, but is that part of the lumber produced from the sweet gum tree which contains too much sapwood to qualify as selected red gum. Occasional boards are all sapwood, but most sap gum lumber contains both heart and sapwood. Selected red gum is all or nearly all heartwood on one face.

The natural range of the sweet gum includes the entire southeastern United States. It favors moist, rich situations and is at its best in the river bottoms close to the Gulf and southern Atlantic regions, and in the lower Mississippi Valley. Maximum size attained is approximately 150 feet high and five feet in diameter.

In furniture, gum lumber is often used with more valuable woods, such as walnut. It stains well to blend harmoniously with other woods. Most flush doors produced in the South have gum veneer faces, and immense quantities are processed into plywood and veneers each year.

BLACK GUM AND TUPELO

Genus: NYSSA. Principal lumber species: *sylvatica* and *biflora* (black gum); and *aquatica* (tupelo).

GENERAL CHARACTERISTICS: Moderate density, texture fine and uniform; grain interlocked. Stability poor; requires skillful seasoning to prevent excessive warp and twist. Machines very smoothly and turns well. Tree is deciduous; wood diffuse porous. Little contrast in spring and summer wood; hence annual growth is inconspicuous and wood lacking in character. Weight varies considerably; average about 2.5 lbs. per board foot, kiln dried. Color of sapwood nearly white; heartwood light, but with yellowish or brownish cast; sometimes streaked.

Although the first two species listed in the heading are generally known as black gums, and the third as tupelo, all three are referred to as "tupelo" in some quarters. Where they are cut together, no effort is made to separate them by species. It is a fact however, that the wood of upland black gum is harder and heavier than that from swamp grown trees, and possibly more valuable for some purposes.

The genus name "Nyssa" is that of a fabled water nymph, and is indicative of the waterloving habit of these trees. Nyssa sylvatica is widely distributed throughout the entire eastern half of the United States. It is the common black or sour gum. Nyssa biflora, the swamp black gum, lives in swamps and other moist places along the coastal region from Maryland to eastern Texas. Nyssa aquatica, the tupelo or cotton gum, grows in southern swamps mixed with cypress, red gum and swamp white oak.

The principal uses of these woods include furniture and hidden furniture parts, mouldings, woodenware, crating plywood veneers, crates, boxes and paper pulp.

The Nyssaceae is considered a separate family of plants by some authorities, while others place it in the dogwood family, which includes our flowering dogwood.

HACKBERRY

Genus: CELTIS. Principal lumber species: *occidentalis* (hackberry); and *laevigata* (sugarberry).

GENERAL CHARACTERISTICS: Medium density, hardness and strength. Tree is deciduous; wood ring porous. Color creamy white, often with grayish cast; no strong contrast between sapwood and heartwood; annual growth rings clearly visible.

Celtis occidentalis, the hackberry, is of scattered but rather common distribution throughout the eastern half of the United States. Celtis laevigata, the sugarberry, is a tree principally of the southeastern states. It is more plentiful and furnishes most of the hackberry lumber of commerce. Since most of the hackberry lumber is from the south, it would be more nearly correct to call it sugarberry, but nobody does, and it is not expected that there will be any change in the common name of the wood at this late date. With sugarberry predominating, the two trees, which are very closely related, are cut and marketed together as hackberry.

Both species are members of the elm family and it has been the practice in some quarters to mix hackberry lumber with white elm. Hackberry is unusually susceptible to sap stain, and must be handled expeditiously and according to best modern practice to prevent this. When it is thus handled, the wood is one of the loveliest and most neglected of our American hardwoods. It is capable of receiving fine finishes and those who have used it for interior trim, wall paneling and the like, speak of it most highly.

WESTERN HEMLOCK

Genus: TSUGA. Species: *heterophylla*

Once disregarded entirely as a decorative wood, western hemlock is now being used to

make many articles of wood; doors, for example.

The pale brown or grayish wood is fairly light to medium in weight, strong and reasonably stable. The figure is almost too pronounced, with strongly contrasting layers of spring and summer wood. Not, one might suppose, a material to challenge the talents of a journeyman cabinetmaker.

Yet, when properly finished, the wood is astonishingly good-looking . . . and it is presently gracing many of America's fine homes.

A member of the pine family, western hemlock grows in humid regions along the coast from Alaska to California and inland as far as western Montana.

The eastern hemlock, Tsuga canadensis (or americana), is valued as a park tree and also produces lumber, but the wood is notoriously inferior and of small commercial importance.

HICKORY

Genus: HICORIA (listed as Carya in some tree books). Principal lumber species: *ovata* (shagbark hickory); *laciniosa* (big shellbark hickory); *tomentosa* or *alba* (mockernut hickory); and *glabra* (pignut hickory).

GENERAL CHARACTERISTICS: Very heavy, hard, elastic and strong. Toughest and strongest American wood in common use. Machines and turns well; steam bends well. Tree deciduous; wood ring porous. Annual growth rings distinct. Color of heartwood, light reddish brown; Sapwood white.

The hickorys and pecans are members of the walnut family and are so closely related that individual specimens of hickory and pecan cannot be identified with any certainty. An inspector of the National Hardwood Lumber Association will not attempt to separate the two when mixed.

These are slow growing trees, requiring 100 years or more to attain timber size. They are particular about where they put down their roots, thus usually are of widely scattered occurrence, although fairly dense stands are sometimes found. They grow in company with other hardwoods; seldom or never alone.

Since, for our purpose, there would be little point in describing the ranges of each species, it will suffice to say that one or the other is found in the entire eastern half of the United States, with the exception of small areas in the extreme north.

The timber of hickory is extremely valuable because of its toughness and elasticity. It is the hardest, heaviest and strongest American wood in common every-day use. Its widest uses are those in which strength is the principal consideration, including vehicle and implement parts, handles, athletic equipment, such as skis; ladder rungs and the like. In the case of handles, ash is preferred for lifting tools, because of lighter weight, while hickory is better for striking tools, because of greater strength. Hickory is sometimes used for inexpensive archery bows, but it is an indifferent wood for that purpose, as the bow will soon "follow the string."

In addition to its uses as lumber, hickory wood is famous for smoking meats. No other wood seems to be as satisfactory for this purpose.

HOLLY

Genus: ILEX. Principal lumber species: *opaca*.

GENERAL CHARACTERISTICS: Medium hardness and strength. Tree is evergreen; wood diffuse porous. Grain and texture extremely fine; annual growth indistinct. Luster high; machines smoothly and polishes easily. Color chalky white, oxidizing with age to light brown.

The American holly is better known for the bright red berries and spiny green leaves at Christmas than as a lumber tree. Occasional trees in the south have been reported up to 80 feet high and four feet in diameter. These are the exception and much above the average. The natural range is from the coast of Massachusetts, where holly is a shrub, southward into Florida, and throughout the southern states into eastern Texas, reaching as far north in the central section as southern Indiana.

In most shops, holly is employed, if at all, for inlays, marquetry and the like, where the white color contrasts sharply with darker woods. It is used to a limited extent in cabinet work, small turnings, small musical instruments and keys. The fine grain makes it suitable for wood engraving. Holly is the whitest of the American woods.

VIOLET KINGWOOD

Genus: DALBERGIA. Principal lumber species: *cearensis*.

Also called violetwood. This little tree is one of the rosewood group and is found principally in Ceara, Brazil. The timber is so small that the wood is used chiefly for inlays, marquetry, small turnings, etc. The wood differs from rosewood in graining and color. It is characterized by fine stripes of alternating concentric layers of violet-

brown and black or blackish violet. This most unusual color may fade into dark brown upon exposure but in all cases the wood is handsome and of distinctive appearance. As with all members of the genus Dalbergia, the wood is fragrant when freshly cut, but in kingwood, it is very faint when the material is dry. In common with other woods of this type, only the heartwood is used. The sapwood is valueless.

KOA

Genus: ACACIA. Principal lumber species: *koa*.

Koa is the best known and most highly prized of Hawaii's hardwoods. It is used locally to produce the ubiquitous Hawaiian woodenware, and it is a valuable wood for musical instruments because of its resonant qualities; it is the wood from which Hawaiians produce their ukeleles.

Color is light to dark brown with distinct golden luster; sometimes with irregular darker streaks. Grain is sometimes wavy, sometimes striped, requiring moderate care in working to avoid grain lifting. The wood is similar to soft-textured oak in density and weight.

An unusually fine-textured, lustrous wood, offering first class finishing characteristics, koa is not plentiful and will never become as well known or as widely distributed as some other furniture woods. But lucky souls here and there around the world will acquire beautiful koa pieces and will regard them as treasures, and ultimately as family heirlooms.

KORINA*

Genus: TERMINALIA. Principal lumber species: *superba*. (Common names include "limba" and "afara.")

Korina, a product of West Africa's Belgian Congo, is a copyrighted trade name applied to a blond timber, specially manufactured and chemically treated to prevent stain.

Korina is a true blond wood of excellent technical properties. Because of its color, it is peculiarly suited to furniture, fixtures, radio and television cabinets and other articles of modern design.

In texture, straightness of grain, hardness, strength, machining and finishing characteristics, it measures up well with other valuable tropical woods. While bleaching is not necessary in ordinary work, one coat of any good, two-part bleach is helpful when perfect uniformity of color is desired. Korina is one of the easiest woods to fill and finish successfully. The finished appearance is reminiscent of prima vera, avodire and other blond tropical woods.

*Copyright trade name of U.S. Plywood Division, Champion International.

LEMONWOOD

Genus: CALYCOPHYLLUM. Principal lumber species: *candidissimum*.

This tree grows in southern Mexico and Central America as well as in Cuba, but the timber known to the export trade is from Cuba. It is also known as Cuban degame.

Lemonwood is one of the few natural bow woods. Until a few years ago it was widely used in the production of archery equipment. Now nearly all commercially produced bows are composed of alternating layers of fiber glass and hard maple, laminated permanently and tillered to bow form, usually with some decorative wood of value in the handle. Even if lemonwood were available, it would no longer be in demand.

The wood is light yellowish brown, very fine and even in texture and hard. Despite its density, it is not difficult to work, and finishes to a high polish.

LIGNUM VITAE

Several species of genus GUAIACUM.

The common name means "wood of life." Lignum vitae was once supposed to possess remarkable curative powers. The resins distilled from it are still used in certain patent medicines. The wood is one of the hardest and densest known; harder than many metals.

Lignum vitae has been employed for many years for the bearings lining the stern tubes of steamship propeller shafts. It requires no lubricant and in many situations will outwear brass and babbitt bearings several times over, thus is especially valuable for bearings under water. Other uses include pulleys, brush backs, stencil and chisel blocks, etc.

The wood is found in Mexico, the West Indies, the coastal regions of Central America and the northern fringe of the South American Coast. Color of heartwood is dark brown, oxidizing to greenish brown, sometimes mottled or striped. Specific gravity 1.10 to 1.32, i.e., the wood will not float.

HONEY LOCUST

Genus: GLEDITSIA. Principal lumber species: *triacanthos*.

Almost everyone knows the common honey locust, with its light, graceful foliage, its curving, S-shaped pods, purple in fall, and the formidable thorns, sometimes single, sometimes in clusters, and looking large and sharp enough to serve as stilettos. The wood at first glance looks a good deal like red oak, but it is coarser in texture, a brighter orange brown or bronze color and the prominent medullary rays characteristic of the oaks are absent.

The tree is of scattered occurrence throughout the eastern half of the United States, but is at its best in southern Indiana and Illinois, and in the Mississippi Valley generally. The wood is a little hard to work but can be polished to high luster. Unless very carefully seasoned some fine checking may develop. It is rather durable, and has been used for various purposes requiring a heavy, hard and strong wood.

The locusts belong to the legume, or bean family, and are quite well-known as park trees. It is a species of locust which is supposed to have fed John the Baptist in the wilderness. The pods in their middle stages are edible.

MAGNOLIA

Genus: MAGNOLIA. Principal lumber species: *grandiflora (southern magnolia); virginiana* (also cut and sold as southern magnolia).

GENERAL CHARACTERISTICS: Medium density, hardness and strength. Magnolia grandiflora is evergreen. Magnolia virginiana is evergreen in the deep south, but ranges much farther northward than grandiflora, and is deciduous in its northern range. Wood is diffuse porous; texture fine and even. Machining and finishing qualities excellent; stability excellent. Color of heartwood, light to dark yellowish brown, sometimes with olive and occasionally with purplish tinge. Dark brown, black or varicolored heart mineral streaks are not uncommon. Sapwood is lighter to off-white. Magnolia stains well and is attractive in natural finishes.

Of the two magnolia species mentioned, grandiflora is more important commercially. It is the largest broad leaf evergreen of the Northern Hemisphere. Occasional trees have been found 100 feet in height and twelve feet in diameter at the stump. It is found in the coastal and Gulf States from North Carolina to eastern Texas, usually in the southern part of the state, but covering all of Louisiana and touching the southern tip of Arkansas. The range of Magnolia virginiana generally corresponds to that of grandiflora except that it extends farther north along the Atlantic coast. Both species are marketed as magnolia wood, although grandiflora is thought to be more valuable in some respects.

Magnolia is fine-textured, straight grained and rather easy to work, thus is desirable for a great many purposes. These include furniture, planing mill products, interior trim, cabinets, store fixtures, venetian blinds and many others. The pores are very fine and the wood may be finished without filling.

Magnolia is said to be the most decorative of all our forest trees. It is widely cultivated as an ornamental tree where climate permits and is famous for the large, showy, fragrant white flowers.

GENUINE MAHOGANY

Genus: SWIETENIA. Principal lumber species: S. *macrophylla*—Mexican, Central and South American mahogany. S. *mahagoni*—West Indian mahogany.

GENERAL CHARACTERISTICS: Moderate density and hardness. Strength factor high in comparison to weight. Unsurpassed working and finishing characteristics. Polishes to high luster. Stability excellent; durable in situations favoring decay. Tree is deciduous, although virtually an evergreen; wood is diffuse porous. Pores are open, requiring filling in conventional type finishes. Texture even; annual growth visible. Color medium reddish brown; much lighter than most persons suppose, although the wood will darken considerably with the years.

Although opinions may differ on this point, most woodworkers regard genuine mahogany as the premier cabinet wood of the world. It has everything to recommend it for fine furniture, fixtures, interior trim, cabinetry and other objects created for lasting beauty as well as utility. It turns and carves superbly, thus is the preferred wood for permanent patterns. It is also used as structural parts and for trimming fine boats.

Only the genus Swietenia may be sold as "mahogany" without using a qualifying prefix. There are many relatives, but to sell them as mahogany without explanation is deceptive and illegal.

Most genuine mahogany now reaching the United States is from Mexico, Honduras, Brazil and Peru. Mahogany from the West Indies (including Cuba) is no longer commercially available in the United States. Production is limited and consumed locally.

AFRICAN MAHOGANY

Genus: KHAYA. Principal lumber species: K. *ivorensis* and K. *anthotheca*.

GENERAL CHARACTERISTICS: Very close to those of the American mahoganies described above.

There are several species of African mahogany (Khaya), of which the two mentioned above make up the bulk of the African mahogany consumed in the United States.

African and American mahoganies are very closely related botanically, hence are similar in physical structure and appearance. Wood connoisseurs regard genuine American mahogany as superior in working, finishing and other technical properties, while the wood of the African species tends to be more prominently figured. It is not uncommon to see fine pieces in which the exposed structural parts are of genuine mahogany, with the veneers African mahogany.

The texture of African mahogany is slightly coarser than American mahogany and hence a little more absorptive; the same stain will produce different colors on the two.

Regardless of comparative merits of the two mahoganies, African mahogany is a decorative wood of the first rank, universally admired by lovers of fine woods.

PHILIPPINE MAHOGANY

Genus: SHOREA and PARASHOREA. Principal lumber species: S. *polysperma* (tanguile and bataan); S. *negrosensis* (red lauan); S. *eximia* (almon); and P. *malaanonan* (bagtican).

GENERAL CHARACTERISTICS: Medium density and hardness. Dark red varieties somewhat firmer in texture than light red. Strong in comparison to weight. Machining and finishing properties excellent. Luster high; texture fine and uniform. Diffuse porous, but pores are moderately prominent and require filling in conventional type finishes. Durable in situations favoring decay. Color of dark red types: dark brownish red. Color of light red types: light yellowish red.

NOTE: The woods marketed as "Philippine mahogany" are also sometimes called "lauan." They are from the great family of Dipterocarps and are not even related to American and African mahogany.

There are a number of species comprising the Philippine mahogany group; of which those listed supply most of the Philippine mahogany lumber sold in the United States. The wood of these trees is often mixed as to species, but almost always divided for color, and sold as either "dark red" or "light red" Philippine mahogany. Tanguile, bataan and red lauan are the dark red varieties; almon and bagtican, the light red. While the properties of all these species are quite similar, dark red types are firmer in texture and command somewhat higher prices in the market.

Compared to the prices of other woods, of lesser intrinsic value, Philippine mahogany, either light or dark red, is the most reasonably priced fine cabinet wood on the market today. It is not as receptive to fine finishes of the "piano" type as genuine mahogany, but the difference is one of degree. Philippine mahogany does not suffer at all by comparison with the average good cabinet timber.

The uses of Philippine mahogany are those common to other good cabinet woods. It is an excellent wood for furniture, fixtures, residence and office building trim, mouldings, wall paneling. It is a superior boat lumber. Philippine mahogany plywood is available at moderate cost, and the two color types lend great flexibility in finishing to any of the popular wood colors.

For years, we have been stressing the virtues of Philippine mahogany as an industrial arts wood. It is easy to work and finish, easy to glue, and a relatively inexpensive hardwood when the effective results, which may be obtained with it, are considered. (Also please see Meranti.)

MANSONIA

Genus: MANSONIA. Species: *altissima*. Other common names: Aprono (Ghana); Ofun (Nigeria); Bete (Ivory Coast).

From West Africa, this wood is used in the United States as a substitute for North American black walnut, which it resembles in color and grain. The narrow sapwood is whitish, but the heartwood is deep yellowish to grayish brown, often with purplish areas. The heartwood is very durable, and it rates well with walnut in strength.

Mansonia works well in all hand and machine tool operations. It is not abrasive, takes nails, screws and glue well, and will accept the finest finishes.

On an overall assessment, Mansonia is a fine cabinet and furniture wood, a suitable vehicle for the best craftsmanship.

HARD MAPLE

Genus: ACER. Principal lumber species: *saccharum* (sugar maple); and *nigrum* (black maple). Some botanists consider nigrum only a variety of saccharum. For all practical purposes, they may be regarded as one species.

GENERAL CHARACTERISTICS: Hard, heavy and strong. Famous for resistance to abrasive wear. Odorless and tasteless. Tree is deciduous; wood diffuse porous; annual growth visible, but inconspicuous. Very fine texture and grain; does not require filling. Heartwood very light brown or tan, sometimes with darker mineral streaks. Sapwood white or off-white.

Hard maple is the most valuable member of the maple family, and the most plentiful. Its range includes most of the hardwood region of the eastern United States and Canada, but in the United States, the best stands are near the Great Lakes and in the St. Lawrence Valley and northern New England.

The excellent technical properties of hard maple have recommended it for a wide number of industrial uses. Its superiority in wearing quality makes it the leader in woods for flooring in residences, dance halls, schools, skating rinks, bowling alleys and shops. Furniture of hard maple, if well made, may be expected to outlast the owner while serving the esthetic sense as well as the practical.

Hard maple is the standard wood for cutting boards in packing plants, restaurants and homes, as it imparts no taste to food and holds up well. It is suitable for implement and machinery parts, turnery, wooden dishes and a variety of planing mill products. Some trees develop a figure of a special type, such as curly grain, fiddleback, mottle and bird's-eye. The cause of bird's-eye figure is not known, but we do know it is not caused by birds, bird pecks or any of the causes to which it is popularly attributed.

The tree is called sugar maple for the sweet sap, which flows profusely in early spring and is the source of syrup and sugar of considerable economic value.

SOFT MAPLE

(Soft maple group includes box elder)
Genus: ACER. Principal lumber species: *rubrum* (red or swamp maple); and *saccharinum* (silver or white maple). Box elder species: *negundo*.

GENERAL CHARACTERISTICS: Medium density, hardness and strength. Machining and finishing properties good; stability good. Fine texture; close grained; wood does not require filling. Annual growth inconspicuous. The color of heartwood varies greatly, from pale tan to reddish gray, sometimes streaked. Sapwood is white to off-white.

The term "soft maple" is a little misleading, as the wood is not really soft. Its density is similar to that of magnolia and gum, and the name was intended primarily to distinguish it from hard maple. The range of the soft maples includes almost the entire eastern United States, the area of greatest commercial importance including the Atlantic coast region from southern Virginia through the Carolinas. Silver maple is less abundant than red maple, although in the Mississippi Valley, it is the predominant of the two.

The most important use of soft maple is in the furniture industry, which consumes large quantities of it. Much of the medium priced colonial maple furniture is of soft maple. Much soft maple in the lower grades goes into boxes, crates and other shipping containers. It is odorless and tasteless, thus is suitable for use in the handling of food. Other uses include coin operated machines, truck body and trailer parts, toys, wooden refrigerators, etc.

In certain areas, particularly in the South, soft maple lumber contains spot worm holes. Thus specifications for southern soft maple include the designations "WHAD" (worm holes a defect), or "WHND" (worm holes no defect), meaning that the stock contains little or no worm defect (WHAD) or may include worm holes without limit (WHND). The worm holes in WHND stock are small and fill readily. They are never so numerous as to detract much from the value of the lumber in paint and enamel work.

There is a third soft maple, which furnishes only limited amounts of lumber. This is Acer negundo, the box elder. It has produced trees 70 feet high with trunk four feet in diameter, but this is unusual, the average box elder divides near the ground into several parts, producing no timber. The box elder cut is usually mixed with soft maple, without comment by the manufacturer.

MERANTI

Genus: SHOREA. Principal lumber species: dark red meranti, *curtisii* and *pauciflora;* light red meranti, *acuminata, leprosula, macroptera* and *parvifolia;* white meranti, *bracteolata* and *hypochra;* yellow meranti, *faguetiana* and *resinanigra*.

The woods sold as meranti are from Malaysia. They are closely related to the species sold as Philippine mahogany, and to the Borneo wood known as seraya. In fact, it is fairly safe to suggest that physical differences are due to

geographical variations in soil and climate, and that differences in nomenclature are more circumstantial than necessitated by fact.

All the merantis season, work, finish and look like their Philippine counterparts. Of the four types differentiated for commercial purposes, only dark red meranti and light red meranti are commonly sold in the United States. A brief comment on each type follows:

DARK RED MERANTI: Heartwood is dark red-brown. Longitudinal surfaces are often marked with narrow white streaks, which are solidified resin, and which may disappear in finishing. Resistance to this white streaking in the U.S. seems to explain why dark red meranti is seldom found in this country, although it is by far the most popular of the merantis in other world markets. It is somewhat denser than corresponding Philippine species.

LIGHT RED MERANTI: Almost indistinguishable from light red Philippine mahogany.

WHITE MERANTI: Not found in U.S. markets. Limited production is consumed locally. It is almost white when freshly cut, weathering to light yellowish brown. It is harder and heavier than light red meranti.

YELLOW MERANTI: Similar to light red meranti in physical properties, but better shock resistance and shape retention. Heartwood is light yellow-brown weathering to a darker yellow-brown. Limited production seldom or never available in the U.S.

MYRTLE

Genus: UMBELLULARIA. Principal lumber species: *californica.*

One of the very large family of laurels, which includes our sassafras tree, and other species producing cinnamon and camphor. The tree, which is quite large when mature, is found along streams in southwestern Oregon. The timber is highly esteemed for furniture. Burls and gnarly trunks are sliced for veneers, usually marketed as Oregon myrtle.

The wood is yellowish brown, sometimes with olive cast, and can be polished to very high luster. It machines, turns and finishes easily and attractively. Sometimes freshly cut logs are placed in water for long periods, darkening the wood and producing the so-called black myrtle, which is highly prized for furniture and interior trim.

THE OAKS

Genus: QUERCUS. Principal lumber species: So many different species of oaks are cut for lumber that it seems pointless to list them in a catalog of this kind. As far as we know, it would be impossible to purchase oak lumber in the market according to species.

GENERAL CHARACTERISTICS: Very hard, heavy and strong. Fairly easy to work, density considered. Turns, carves and bends well. Sanding and finishing qualities excellent; stability excellent. Except for the live oaks, which are not a factor in the lumber industry, the oaks are deciduous and the wood ring porous. Color of heartwood in red oaks is reddish or light reddish brown; in white oaks light tan or brown.

The oaks comprise the most important group of hardwood timber in the United States. None is better known or more widely used.

As explained above, there are many separate species cut and marketed as oak lumber. The genus Quercus seems to have a distinct tendency to variation for no apparent reason. Oak lumber is sold as either red oak or white oak, with no attempt to separate or identify the different species. There are certain important distinctions which cause this separation, however, which may be of interest. From information supplied by the Southern Hardwood Producers these are as follows:

RED OAKS

1. Acorns require two years to mature.
2. Leaf lobes bristle-tipped.
3. Color of heartwood tends to be reddish.
4. Vessels of heartwood have few tyloses; wood consequently not waterproof.
5. Freshly cut wood has a sour, often unpleasant odor.
6. Pores in summer wood few. Can be counted under a hand lens.
7. Annual rings usually widely separated, resulting in coarser textured wood.
8. Heartwood not particularly durable under conditions favoring decay.

WHITE OAKS

1. Acorns mature in one season.
2. Leaf lobes rounded.
3. Color of heartwood tends to be tan or brownish.
4. Vessels of heartwood have abundant tyloses; wood consequently waterproof.
5. Freshly cut wood has a distinct but not unpleasant odor.
6. Pores in summer wood numerous and small. Cannot be counted even with a hand lens.
7. Annual rings usually compact, resulting in finer textured wood.

8. Heartwood quite durable under conditions favoring decay.

The oaks are related to the beech and chestnut, but in some ways the Quercus family is unique. It is the only tree bearing acorns, certain species of which are edible. It is one of the few groups including both evergreen and deciduous trees (the live oaks are evergreens). Its range is probably greater than that of any other of our important hardwoods. It is found all over the United States east of the great plains, and on the West Coast.

The uses of oak lumber are almost too numerous to permit listing. Almost any article which can be made of wood has, at one time or another, been manufactured from oak. So long as those responsible for design and finish are alert to the possibilities of this fine material, oak will always be a popular furniture wood. Few woods are more beautiful when skillfully handled, and few can be finished in so many attractive ways. There can be no doubt about the serviceability of oak furniture; it will last for generations with ordinary care.

Everyone is acquainted with oak as interior trim, both in public buildings and in the home. It is attractive, durable and requires the minimum of care. No other wood is as handsome and lasting for residence flooring.

In addition to its decorative usage, oak as a utility wood has provided services beyond count. It has been used for every practical purpose from railway cross-ties to tight cooperage; from truck flooring to bridge timbers.

When considering whether to buy red or white oak, it will be useful to know that one will serve about as well as the other for most purposes. There is one important exception to this rule. Where the wood will be exposed to decay, as in boat parts, white oak should always be used. The pores in the heartwood of the white oaks are filled with mineral and chemical deposits known as tyloses, which add greatly to its durability. It follows that red oak is not suitable for tight cooperage, such as casks for aging alcoholic beverages, as the wood is not waterproof.

Another point of interest is that white oak is a misnomer because it is not actually white in color but light tan or light brown and not at all uniform. Where uniformity of color is desired, one will more nearly approach it by using red oak.

The three most common types of figure in both oak lumber and oak plywood are as follows:

1. Plain sawn or plain sliced, produced by cutting on tangential section.
2. Quarter sawn or quarter sliced, produced by cutting at right angles to the circumference of the tree, exposing the wide medullary rays typical of oak.
3. Rift or comb grain, produced by a cut midway between plain and quartered, which shows the edges of the medullary rays, providing a thin line effect.

OBECHE

Genus: TRIPLOCHITON. Principal lumber species: *scleroxylon*.

Obeche grows over a large part of West Africa. The best is said to come from Nigeria. Other common names include ayous, samba, wawa and African whitewood.

Obeche of good quality is a pure, even white color with a yellowish cast, the color more even than that of other popular blond woods. Attractive, tropical grain and figure.

Formerly, there was difficulty in marketing, because of the tendency to develop blue stain. This has been overcome by kiln drying in Africa, or by cutting the lumber in the U.S. and kiln drying at once. A good cabinet wood, although too soft for some uses. Obeche is a favorite pattern wood in European countries.

PADAUK

Species of PTEROCARPUS.

There are three principal sources for Padauk: Africa, the Andaman Islands and Burma. There are some variations, but in general the wood tends to golden red color, with streaks of straw to golden yellow, showing darker streaks. The variety from Africa is almost entirely red.

Padauk, (pronounced Paduke, with the accent on the second syllable), is also commonly known as Vermillion. It is characterized by swirly, interlocked grain and is easily one of the truly beautiful woods of the world.

There is also a padauk species in the Philippine Islands, known as NARRA. The people of the Philippines regard this as their finest cabinet wood, and most of it is consumed locally. Unlike padauk, narra produces wood of two distinct colors, one predominately brown and the other predominately red. These are separated in lumber form and sold as brown narra and red narra. Pradu, a closely related wood, is sometimes imported from Thailand.

PALDAO

Genus: Dracontomelum; species; *dao*.

One of the finest cabinet woods of the Philippines, and one of their costliest. Unlike most Philippine woods, it is not related to the Philippine mahogany group and does not resemble those species.

Paldao is similar to walnut in weight and density. It is hard and strong enough for any ordinary purpose. Difficult to describe, at a glance it is reminiscent of a striped piece of American walnut, although it would never be mistaken for walnut.

Of limited availability, and not well known, paldao is sometimes selected by architects for high class fixture installations. It is striking and beautiful, typifying what most of us think of as "exotic."

PECAN

Genus: HICORIA (listed as Carya in some tree books). Principal lumber species: *pecan* (sweet pecan); *aquatica* (bitter pecan); *cardiformis* (bitternut hickory) and *myristicaformis* (nutmeg hickory).

GENERAL CHARACTERISTICS: Very heavy, hard, elastic and strong. Next to true hickory, toughest and strongest American wood in common use. Machines and turns well; steam bends well. Tree deciduous; wood ring porous. Annual growth rings distinct. Color of heartwood, light to dark reddish brown, sapwood white.

Although the range of one of the pecan species, the bitternut hickory, includes most of the eastern United States, pecan is essentially a southern wood. It is at its best in Louisiana, eastern Texas, Mississippi, Arkansas, and throughout the Delta region. From here it ranges through the Gulf States to Florida.

Although the pecans are all hickories and their characteristics are similar in most respects, there are slight differences which apply in general. Pecan is not quite as hard and tough as hickory, but is still harder than other commercial species. The color of the heartwood will vary, but, in the main, pecan is a little darker than hickory and inclined to display a slightly more reddish hue.

Offering great strength, resistance to abrasive wear and really exceptional finishing qualities, pecan is an excellent furniture and flooring wood.

PERSIMMON

Genus: DIOSPYROS. Principal lumber species; *virginiana*.

We seldom think of persimmon as lumber, yet for certain technical uses it is quite valuable. It is very hard, dense and strong; about the same as hickory, and in addition stays smooth when subjected to continuous rubbing and wear. Its principal uses are for heads of golf clubs and for shuttles used in the textile industry. Dogwood is preferred for shuttles, but when not obtainable in sufficient quantity, persimmon is an acceptable substitute.

Only the sapwood is used. Some old trees have a small amount of heartwood, which is black, or dark brown streaked with black. The tree, however, is very largely sapwood.

Persimmon is found throughout the entire southeastern United States, as far north as central Pennsylvania and Kansas, but the bulk of the supply is in Arkansas, Mississippi, Alabama, Georgia and Florida. It is a member of the ebony family, is closely related to the woods we know as ebony, and is often referred to as American ebony.

PARANA PINE

Genus: ARAUCARIA. Principal lumber species: *angustifolia*.

This is the most important timber tree of Brazil. A closely related tree *(Araucaria araucana)* is valuable for timber in Chile. The Brazilian parana pine is faintly suggestive of our native pines, although it is of finer texture and the annual growth rings are not as pronounced. These trees are not true pines but are probably distantly related. The leaves are larger and stiffer but are reminiscent of pine needles, and the seeds are borne in large cones.

Parana pine lumber is used in substantial amounts in the United States, and would probably be more popular than it is, except for the presence of what is called "compression wood," which detracts markedly from its stability. Parana pine plywood is of excellent quality.

THE PINES

From the commercial point of view, the pines comprise the most valuable group of timber trees in the world. In addition to wood and pulp, they supply the natural resins known as "naval stores," so-called because these materials, including spirits of turpentine, resin, tar and pitch, were once so essential to the operation and maintenance of sea going vessels.

There are supposedly about 35 species of pines native to the United States and of these some 28 supply lumber to some extent. Mentioned here are only the few which supply the bulk of the pine lumber we use. Botanical references and general characteristics are mentioned under each individual or group heading, except the facts that all pines are evergreen conifers, the wood non-porous, annual growth rings are conspicuous, due to strong contrast in spring and summer growth.

PONDEROSA PINE

Genus: PINUS. Principal lumber species: *ponderosa.*

Sometimes listed in tree books as western yellow pine, soft-textured stock from large timber has in the past been marketed as California white pine, Arizona white pine, ponderosa pine, etc. Ponderosa pine is not a white pine in the botanical sense and it is illegal to offer it as such. The general distribution of ponderosa pine is in mountainous regions from British Columbia far into Old Mexico and from California to Nebraska, forming great forests in favorable places. Naturally, there is great variety in the quality of timber coming from such a vast region. The wood can be hard and coarse textured, or it can be so fine in grain and texture as to rival the best of the true white pines.

Because of the huge supply available, the ease with which the wood is worked and its excellent dimensional stability, ponderosa pine is our most important planing mill species. Many large sash and door plants operate almost entirely on it. On-the-job fitting of sash, doors, cabinets, trim and mouldings is relatively easy as the wood yields readily to hand tools.

Most ponderosa pine is painted, but there is an increasing tendency to finish it with varnish or lacquer. Clean looking and attractive in its natural color, it accepts stains remarkably well, especially the new gelled stains, which do not cause blotching.

Knotty pine wall paneling and furniture has been popular in recent years. The common grades, in which the principal defect is knots, are used for this purpose. Substantial quantities of ponderosa pine plywood are produced. It is popular for cabinet work, door panels, etc., as it finishes well and is relatively inexpensive.

Lower grades are cut to common dimension and boards; used for light construction, subflooring, sheathing, inexpensive shelving and the like.

In purchasing any pine lumber, a little knowledge of the theory under which it is graded is essential if an intelligent selection of the right quality for the job at hand is to be expected. A brief outline of pine grades appears elsewhere in this book.

The color of Ponderosa Pine heartwood is light tan, sometimes with an almost orange cast; sapwood is white.

SUGAR WHITE PINE

Genus: PINUS. Principal lumber species: *lambertiana.*

Sugar pine is the largest of our pine trees. Old trees have been noted almost 250 feet high and twelve feet in diameter. Its cone is also the largest; almost two feet long when fully developed. It is found only in Oregon and California, with 80 per cent of the stand in California. The best development is on the western slopes of the Sierra Nevada and a part of the California coastal range.

The wood is used to a great extent for planing mill products of all kinds, but is best known to woodworkers as a pattern lumber. The texture is fine, soft and uniform and the wood is unusually responsive to carving tools. The sharpest and most intricate detail can be executed cleanly and rapidly by a skillful pattern maker. Relative freedom from dimensional change in the completed pattern adds greatly to the value of sugar pine for both patterns and models.

The knots in sugar pine are usually large and coarse, unsuited for knotty pine wall paneling. Low grades are used for light construction, subflooring and the like; boxes, crates, etc.

The heartwood is light tan or brown; sapwood white. Sugar pine is one of the true white pines and offers a considerable degree of durability when exposed to decay.

IDAHO WHITE PINE

Genus: PINUS. Principal lumber species: *monticola.*

This is one of the genuine white pines, and like the others, is relatively durable when exposed to decay. It grows in mountainous areas from southern British Columbia across northern Idaho, Montana and Washington; and southward through Oregon into California. The tree grows rapidly, yet may live as long as 500 years, reaching maximum height of 175 feet and eight feet in diameter.

Idaho white pine is excellent for planing mill products of all kinds, sash, doors, mouldings, light construction, boxes, crates and a multitude of similar requirements. Its straight, even grain and dimensional stability make it a good pattern wood, although grades suitable for this purpose are difficult to procure. Because of its durability, Idaho white pine is recommended for exterior work where pine is specified. The knots in common grades of this species are numerous, but are inclined to be small and tight, thus this is one of the best of the pine group for knotty pine wall paneling and furniture.

The heartwood of Idaho white pine is a very pale tan or off-white; sapwood, white.

NORTHERN WHITE PINE

Genus: PINUS. Principal lumber species: *strobus*.

With stands estimated as having originally been 800 to 900 billion board feet, this was once the most important timber tree of the United States. It played a tremendously important part in the development of the infant Republic. Now, the remaining stand is comparatively small and is mostly second growth.

The natural range of Pinus strobus is Newfoundland to Lake Winnipeg in Manitoba, southward through eastern Minnesota to southeastern Iowa, east through Wisconsin, Michigan, New York, New England and Pennsylvania, and along the Allegheny mountains to northern Georgia. Commonly referred to as northern white pine, it is sometimes called eastern white pine or cork pine.

Pinus strobus is still being cut, but the remaining timber is mostly small, and produces little clear stock. It is suitable for all the uses to which pine lumber is adapted, including technical requirements such as patterns. In some respects, the wood is intrinsically the most valuable of any of the white pines. In color, weight and other properties, it is similar to Idaho white pine.

SOUTHERN YELLOW PINE

Genus: PINUS. Various species of Pinus.

"Southern yellow pine" is a collective term covering lumber of a number of southern pine trees. There is no separation of species in marketing the lumber, the only differentiation being the designations "long leaf yellow pine," and "short leaf yellow pine." Following are by no means all, but are the principal yellow pine species cut to lumber:

Long Leaf Yellow Pine *(Pinus palustris)*
Slash Pine *(Pinus caribaea)*
Short Leaf Yellow Pine *(Pinus echinata)*
Loblolly Pine *(Pinus taeda)*

Long leaf and slash pines are often cut and marketed together as "long leaf yellow pine." The other yellow pine timbers are commonly sold mixed as "short leaf yellow pine."

There is a pronounced tendency on the part of users to think of long leaf and short leaf types as possessing different technical properties based on the difference in species. In general, long leaf types are slightly harder and stronger than short leaf types, but individual specimens of any of them can be brought forward to disprove the general rule. It is the condition of growth; soil, climate and water supply, which determines the type of wood any of the yellow pine species will be most likely to produce.

It would be difficult to overestimate the value of the yellow pines commercially. They are the source of naval stores, pulpwood, and the timber provides one of our best utility woods. The uses of yellow pine lumber are extremely varied, but the bulk of it is employed in the building industry. Smaller amounts are fabricated into almost every article which can be produced in wood. Often yellow pine is used where some other wood would do a better job, simply because it is readily available and relatively inexpensive. Much reforestation is done with the yellow pines and there is little doubt about the permanency of the supply.

The distribution of one or another of the yellow pines is general throughout the southeastern and eastern United States. There is considerable variation in texture, color and density of stock from different areas. In the main, it is rather coarse-textured, with strongly pronounced annual growth rings, and is definitely brownish yellow in color, sometimes with an orange cast. Some mountain grown stock is relatively soft and easy to work, while that from the swamps of lower Florida, for example, can be extremely dense; almost as hard as oak.

YELLOW POPLAR

Genus: LIRIODENDRON. Principal lumber species: *tulipifera*.

GENERAL CHARACTERISTICS: Moderately soft; low density. Texture fairly fine and uniform; close-grained. Pores

small; some finishers use filler in natural finishes, others do not. Tree is deciduous; wood diffuse porous, with little or no contrast between spring and summer wood. Annual growth distinct to indistinct. Heartwood pale olive-brown to yellow-brown; sapwood off-white to grayish white. Wood works well with either hand or machine tools and is relatively stable.

Some botanists prefer to call this tree Tuliptree, as it is definitely not a poplar. It is not even related to the poplars and cottonwoods, but is a member of the magnolia family. The wood has been known in the lumber and woodworking industries for many years as yellow poplar, however, and it is too late now to try to change its popular name.

The tuliptree is found to some extent throughout almost all of the hardwood lumber regions of the eastern United States, but too widely scattered in some areas to be of commercial importance. As a timber tree, it is at its best in the Ohio Valley region and on mountain slopes in North Carolina and Tennessee. Second growth timber has a thick band of sapwood with very little heartwood. In the Appalachian and eastern sections, this sapwood is nearly white, and the lumber is often called whitewood.

Yellow poplar has produced the tallest hardwood trees on the North American continent. The record is 200 feet, although the largest now known is 150 feet high. It is extremely intolerant of shade, quickly shedding its lower limbs and pushing its crown up into the sunlight. Thus, even relatively small timber produces a good percentage of clear lumber.

The wood is free from resin, is one of the least troublesome woods to kiln dry successfully, glues easily, holds its place well, does not split readily in nailing. It is soft enough to be a favorite wood for working with hand tools. Few woods are more desirable for paint and enamel finishes, and poplar is easily stained to simulate more costly woods in clear finishes.

The properties of yellow poplar are such that it has been used for almost every conceivable purpose, limited only by lack of sufficient strength for some requirements. Some of the principal uses include: piano rims, billiard tables, ironing boards, caskets, wagon boxes, musical instruments, ladders, patterns, kitchenware, inexpensive furniture, usually painted or enameled, trunks, veneers and plywood, store fixtures, interior and exterior trim, toys, excelsior, novelty items, woodenware, siding, sheathing, and many others. Huge quantities of lower grades are used by the box industries.

PRIMA VERA

Genus: CYBISTAX. Principal lumber species: *donnellsmithii.*

Formerly marketed as white mahogany, prima vera is not related to the mahoganies, but belongs to the same family as our catalpa. It is found in southern Mexico, Guatemala, Salvador and Honduras, with most of that reaching the United States coming from Guatemala.

There was some justification for calling the wood white mahogany. It exhibits the figure and graining typical of good tropical woods, and might well be mistaken for mahogany were it not for the color. Prima vera is light straw to golden yellow in color, and possesses unusual finishing qualities, placing it in the same category as other fine cabinet woods of the world.

RAMIN

Genus: GONYSTYLUS. Principal lumber species: *bancanus.* (This wood is known as melawis in western Malaysia.)

Ramin is imported mostly from East Malaysia and the Malayan Peninsula, which is now known as West Malaysia. It is also found in Indonesia.

Both heartwood and sapwood are white to pale straw color; texture is fine and uniform. The wood presents a bright, clean appearance but is rather plain . . . without distinctive decorative features. It resembles American birch in most technical properties, although not as shock resistant. Weight about 3.7 lbs. per board foot in the rough, kiln dried.

Sawn ramin lumber will develop blue stain very quickly if not properly handled, but that is also true of many woods found in the United States. It seasons rapidly and without significant distortion, although special kiln schedules must be followed for best results.

Ramin presents no problems in working and finishing. It is not a great decorative wood but is a very useful one, and it seems to have invaded U.S. hardwood markets for keeps. Some large furniture manufacturers are using it for solids in case goods, stained to match the veneers from more valuable species.

REDWOOD

Genus: SEQUOIA. Principal lumber species: *sempervirens.*

GENERAL CHARACTERISTICS: Soft, light in weight. There is considerable variation in the texture and density of Redwood, but in the main it is fine-textured and even in grain. Very easy to work; seasons slowly but is relatively insusceptible to dimensional change resulting from varying moisture conditions after it is properly seasoned. One of the most durable of all softwoods. Free from resin; takes and holds paint well. Tree is evergreen; wood nonporous. Color of heartwood cherry-red to reddish brown, very low luster; sapwood off-white, annual growth visible.

There are two of the giant Sequoias, the one we know as redwood and the big tree (Sequoia gigantea). The big tree no longer is cut for lumber, as the old trees are protected. It grows in a few scattered groves of a few hundred to several thousand trees each at 5000 to 8500 feet above sea level on the western slopes of the Sierra Nevada mountains in central California. The redwood is found in a narrow strip along the Pacific Coast from southwestern Oregon about 500 miles into California.

The Sequoias are among the most interesting of our native trees. So far as is known, none has ever died of old age. They can be destroyed by fire or felled by storms. Their huge bulk may become out of balance through lopsided growth, so that the tree is easily undermined and overturned. Except for the limitations placed upon them because of their bulk, they presumably would live forever.

The redwood at maturity is a little taller than the big tree, while the latter surpasses the redwood in bulk. Large redwoods may be up to 350 feet high and 25 feet in diameter; large big trees somewhat shorter but up to 30 feet in diameter. The famous naturalist, John Muir, once counted the annual rings of a big tree which he believed to be over 4000 years old.

Redwood lumber is valuable for many purposes, its relative weakness making it unsuitable for some uses for which it would otherwise be admirably adapted. Compared to its weight, however, the wood is very strong. Its greatest strength is evidenced in endwise compression, so that in heavy construction it is more suitable for columns than for heavy beams. Redwood can be employed in almost every part of a house, but it is best suited for those parts which may be exposed to decay. For all exterior parts, and for pergolas, trellises, greenhouses and fences, redwood is without a peer. Among its many uses are: caskets, tanks, silos, beekeepers' supplies, flumes, bridge timbers, general millwork, furniture, water towers, etc. When first exposed to water, some of the coloring matter leaches out, interfering with its use for some purposes.

The redwood sometimes produces burls of extraordinary size, which may be up to six feet in diameter. These may be sawed into lumber or sliced into veneers. Small, freshly cut burls are sold for sprouting; they develop into fern-like bouquets when placed in water. Occasional trees may produce highly figured curly grain, once highly prized.

ROSEWOOD

Various species of DALBERGIA.

All of the true rosewoods known to cabinetmakers are various species of the genus Dalbergia, from Asia, Madagascar, Brazil or Central America. The wood is of excellent technical properties, of beautiful appearance and usually pleasingly fragrant when freshly cut.

The heartwood of these trees varies in color, usually with deep, reddish brown predominating, sometimes with black streaks or mottlings. It is not difficult to work and finishes very smoothly with a high natural polish. It holds its place well in the finished project and is very durable. Only the heartwood is used, the sapwood is valueless.

Cocobolo, sisso, violet kingwood, tracwood from Indochina, tulipwood, nagaed wood and Brazilian jacaranda . . . all are members of the rosewood (genus Dalbergia) group. Properties of all are similar; some are simply considered more beautiful than others. At the top of the list for dazzling beauty is the genuine Brazilian rosewood (also called palisander), Dalbergia nigra, now very scarce and costly.

SAPELE

Genus: ENTANDROPHRAGMA; species: *cylindricum.*

Of widespread distribution, this is one of West Africa's most common timbers. It is related to the genuine mahoganies, and has been marketed as "sapele mahogany," but this is a misnomer which should be dropped entirely.

In most appearance characteristics, sapele closely resembles African mahogany. It has the typical mahogany color, grain and figure. It is not the equal of mahogany in dimensional stability, and should be quarter sawn for that reason. Harder and heavier than mahogany, it weighs about 15% more, with density proportionately greater.

Sapele offers good working and finishing qualities; is used extensively, particularly in Europe, both as veneer and in solid form, for furniture, fixtures, cabinets, case goods and boats.

SASSAFRAS

Genus: SASSAFRAS. Principal lumber species: *albidum*.

Sassafras tea, made from the roots of this tree, was once considered a valuable spring tonic for thinning the blood, and was quite an item of export in colonial days. The bark of the roots is distilled for commercial oil of sassafras, which is used to scent various products.

Settlers along the Mississippi used to make dugout canoes of large sassfras logs, as the wood does not absorb water, thus remains light, and is durable. Sassafras is found in limited amounts over almost the entire eastern half of the United States, but usually so widely scattered and sparse that it is never much of a factor in the lumber market. In favorable locations, trees up to three feet in diameter and 100 feet tall have been noted, but the average mature specimen is smaller than this.

Sassafras wood is used to a limited extent for a variety of exterior requirements. To the cabinet maker it is an unusual and beautiful wood, especially desirable for wall paneling and rustic or novelty pieces of furniture. It bears a remarkable resemblance to chestnut, except that the light brown color tends to have a yellowish cast instead of grayish. The wood is fairly soft and inclined to be brittle. It is easy to work, although some care must be exercised in hand planing not to lift the grain.

SATINWOOD

***Zanthoxylum flavum* (West Indian satinwood); (*Chloroxylon swietenia* (Ceylon or East Indian satinwood).**

West Indian satinwood is found in Puerto Rico, the Bahamas, Bermuda, the Dominican Republic and southern Florida. The wood is fine-textured, often with a beautiful wavy figure, and is golden yellow in color, deepening naturally to rich, light golden brown. It is used in fine furniture, including inlays and marquetry, and for fine brush handles and backs.

Almost all antique furniture which includes satinwood is of the foregoing type. In recent years, Ceylon or East Indies satinwood has come into use here. It resembles West Indies satinwood, but is harder, paler in color and usually more highly figured. Satinwood, when freshly cut, has a definite odor strongly reminiscent of coconut, and has an oily appearance and feel.

SNAKEWOOD

Genus: PIRATINERA. Principal lumber species: *guianensis*.

Very rare and costly; also called Letterwood. The markings vaguely resemble cryptic letters, also look a little like snake skin. The timber is from the Guianas, and like other woods of this type, is valuable only for the heartwood. Adding to its cost is the fact that a 15 inch log may have heartwood only one to four inches in diameter. It is principally used for walking sticks, umbrella handles, inlays, etc. The wood is dark brown to black, of spotted appearance as described.

THE SPRUCES

Genus: PICEA. Principal lumber species: *sitchensis* (Sitka spruce); *engelmanni* (Engelmann spruce). Following three species are marketed as eastern spruce: *canadensis* (white spruce); *rubens* (red spruce); and *mariana* (black spruce).

GENERAL CHARACTERISTICS: Soft and relatively weak, although strength, especially of Sitka, is good in comparison to weight. Machining qualities of Eastern and Engelmann spruce fair; of Sitka spruce poor. Stability excellent. Tree is evergreen; wood non-porous. Texture uniform, annual growth visible but not conspicuous. Color of heartwood very light tan to very light reddish brown, sapwood off-white to white, not strongly demarcated from heartwood.

All the spruces are members of the pine family and are close relatives of the firs. The trees are noted for their beauty; many are cultivated for park and lawn landscaping.

The distribution of **Sitka Spruce** is along the coastal region from Alaska to Cape Mendocino, California. It is the most important timber tree of Alaska, where it is extensively used for general construction. This is the species which produced spar stock and other parts for wooden aircraft. It is suitable for planing mill products and in general may be used for any of the purposes to which a softwood is adapted. It is an excellent material for ladder rails, combining sufficient strength with light weight. One of the obstacles to the use of sitka spruce in fine cabinet work is its poor machining qualities. It is in-

clined to exhibit a certain amount of torn grain unless run on very high speed equipment. This can be removed by sanding but is troublesome.

Engelmann Spruce is a highly ornamental tree, but not of much commercial importance. It grows from 6000 to 12,000 feet above sea level, thus much of the timber is inaccessible. The wood machines cleanly and can be polished to high luster. It is relatively weak, however, and is mostly suitable for general carpentry, cabinet making and light construction.

Engelmann spruce is a feature of the high Rocky Mountains from the Yukon to Arizona. About half of the stand is in Colorado. Most of the lumber cut is in Colorado, Montana and Idaho.

White Spruce, Red Spruce and Black Spruce; one or another of the three can be found all over the northern United States and all but the coldest parts of Canada and Alaska. The red spruce follows the Appalachian Mountains as far south as North Carolina and Tennessee, although all spruces are essentially lovers of cold climates.

Where these three species grow together, they are mixed in cutting and marketed simply as eastern spruce. The wood is useful for a great many articles of utility. It is good for general carpentry, crates, canoe paddles, ladder rails, planing mill products and light construction. Red spruce is used in organ pipes and sounding boards of musical instruments. The most important commercial use of the spruces is as pulp wood. It is considered the most desirable wood for that purpose.

SYCAMORE

Genus: PLATANUS. Principal lumber species: *occidentalis*.

GENERAL CHARACTERISTICS: Sycamore is one of the so-called "soft" hardwoods. It is a wood of medium density, hardness and strength. Tree is deciduous; wood diffuse porous. Close-grained; even but rather coarse texture. Annual growth inconspicuous. Color of heartwood; flesh pink to brownish pink; sapwood lighter.

Our American sycamore is not the sycamore of biblical fame. It is the American plane tree, but we have known it as "sycamore" for so long that it would be useless to try to attach some other name to it. Its range includes practically the entire eastern half of the United States, although it avoids part of the northern Great Lakes region.

The sycamore is our largest broad leaf tree. Individuals 170 feet tall and up to 14 feet in diameter have been observed. The average mature tree is up to 120 feet in height and two to five feet in diameter. Most of the sycamore lumber is from the lower Ohio and Mississippi Valleys, where the tree is at its best.

The interwoven fibers of sycamore wood make it hard to split, and at the same time, somewhat difficult to work. It is handled best on high speed equipment. Quartered stock displays a small, flake figure which is very attractive. All sycamore has a clean, bright appearance. As with practically all hardwoods, quarter sawn material offers a considerably higher degree of dimensional stability than plain sawn stock.

Large quantities of sycamore veneer, usually rotary cut, are used by the packing industry for berry, fruit and vegetable containers. Solid lumber is manufactured into inexpensive furniture, usually stained to imitate maple. It is a good utility wood in the building of cabinets and fixtures, especially for hidden parts, where toughness combined with light weight is desirable. One of the principal uses of the wood is for drawer sides; its bright, cheerful and clean-looking appearance recommend it for that purpose.

TEAK

Genus: TECTONA. Principal lumber species: *grandis*.

Teak timber is imported from Burma, India, Thailand and Java. The wood varies from yellow to rich brown when freshly cut, and darkens upon exposure.

Teak is generally referred to as "oily." It does seem oily to the touch, but it is a concentration of silicates in the wood which gives this effect.

The wood is quite hard and strong. While not exceptionally difficult to work, it blunts ordinary tool steel quickly, because of the minerals and silicates it contains. It is usually straight-grained, although rare specimens are highly figured. It shrinks little in seasoning, and is dimensionally quite stable.

Intrinsically, teak is one of the most valuable of all woods, but its use is limited by scarcity and high cost. It is a beautiful furniture wood, although difficult to glue successfully. A teak floor is a lifetime investment in beauty, durability and low maintenance cost. Due to the heavy silicate content, it does not cause corrosion when placed next to metal, hence is extremely useful in the building of ships. No satisfactory substitute has ever been found for teak in this work. Large teak plantations have been formed to perpetuate the supply.

TIGERWOOD

Genus: LOVOA; species: *klaineana*

Another member of the great mahogany family, the Meliaceae. Sometimes called Alonawood, Congowood or Lovoawood in the U.S., and is commonly known as "African walnut" or "Nigerian walnut" in Great Britain and Europe. It is not related to true walnut. It grows in West Africa, principally in the Ivory Coast, Gold Coast, Congo and Cameroons.

The color is golden brown, with some pieces marked with black streaks, this combination no doubt being responsible for the improper name "walnut." In graining and in texture, it is quite similar to African mahogany. Quarter sawn pieces exhibit the wide stripe figure typical of most tropical woods.

This is a fine cabinet wood. The surface is lustrous, always indicative of good finishing qualities. It is not difficult to machine, sand and finish, and it rates well in stability when properly seasoned. Widely employed in Europe for most of the end uses to which valuable cabinet woods are put.

VIROLA

Genus: DIALYANTHERA. Principal lumber species: *otoba* and *gordonifolia*. Local common name: cuangare.

Older tree books do not even associate the above species, which are found in the Pacific forests of Colombia and Ecuador, with the trade name "virola." It is an excellent example of the confused nomenclature so common in the lumber industry. In this case, the confusion is with the genus Virola, described elsewhere in this section under the trade name "banak."

The two genera, Dialyanthera (virola), and Virola (banak) are closely related, both are members of the nutmeg family. The woods are similar in all respects, although in general the wood marketed as "banak" is slightly firmer in texture and is reputed to offer somewhat better machining characteristics.

Color is uniform pinkish-brown with medium to high luster. There is no demarcation between sap and heartwood. It is a starchy wood and thus perishable in situations favoring decay, and it must be carefully handled if blue stain is to be avoided.

Density is low, weight is about like soft-textured western pines. Virola machines well and easily on good equipment and will accept fine finishes. It is too soft for many uses, but is a good wood for mouldings, core stock for doors, paneling and other uses where strength and resistance to impact damage are not important considerations. It is a good softwood substitute.

NORTH AMERICAN WALNUT

Genus: JUGLANS. Principal lumber species: *nigra*.

GENERAL CHARACTERISTICS: Moderately dense and hard. Strong in comparison to weight. Excellent machining properties. Superb finishing qualities. Tree is deciduous; wood ring porous. Open pores require filling in conventional finishing. Annual growth clearly marked; texture fine and even. Polishes to high luster. Color of heartwood: variegated dark, chocolate brown, sometimes with a purplish cast. Sapwood nearly white.

Walnut is the most valuable furniture and cabinet timber of the United States. It is found as scattered specimens and in small groves over the entire United States east of the great plains but is best developed in the middle-west, the Mississippi and Ohio valleys, Tennessee and the lower Appalachian mountains.

Walnut is found as isolated trees in forest and farm lots, never in dense stands. The logs are hauled, sometimes over long distances, to the mills, adding to the cost of the lumber. The walnut log is relatively short, so that most of the lumber produced is from six to ten feet in length. Top grades are 5″ and wider, averaging about seven inches in width. The small size of the timber does not permit the removal of the sapwood, which is nearly white when freshly cut. Mills specializing in the production of walnut lumber place the stock directly from the saw into steaming pits. Here it is covered with walnut sawdust and other refuse of the mill and steamed until the color of the sapwood is brought as closely as possible to that of the heart. This process still leaves some contrast between heartwood and sapwood, but it is diminished to the point where a skillful finisher can blend the two perfectly.

The beauty of walnut is admired by almost everyone, and there are few homes in the land which do not possess at least one article made of it. Its unsurpassed finishing properties are so inherent that even an amateur finisher can expect excellent results with it. It is one of our best woods to carve, and few woods respond more agreeably to both hand and machine tools. The wood is durable and offers a very high degree of dimensional stability.

The principal uses of walnut are in fine furniture, gun stocks, interior trim, fine cabinets, fixtures, radio and television cabinets, musical

instrument cases and the like. Much walnut is made into veneers for walnut faced plywood.

The bulk of the yield is in plain sawn lumber and plain sliced veneers. Occasionally one sees walnut quarter sawn or sliced. This is usually called "pencil stripe" walnut, as this method of cutting displays the edge of the annular growth rings as a series of narrow bands or lines. Walnut crotches and stumps close to the roots are valuable for the highly figured stock produced from them. Crotch and stump walnut is never seen as solid wood, but always in veneered panels. This is true also of burl walnut. The tree sometimes produces burls large enough to be sliced into veneers.

PERSIAN WALNUT

Genus: JUGLANS. Principal lumber species: *regia*.

The walnut species producing the nuts we know as English walnuts originated in Persia, and was carried far and wide over the European continent by men who valued the trees highly as a source of food. Thus English walnut, French walnut, Persian walnut, Italian walnut, Circassian walnut, etc., are all the same, and the only difference in appearance is that occasioned by differences in soil and climate.

Imported walnut lumber is quite similar in grain to our native black walnut, but is lighter in color and inclined to exhibit a faintly grayish overtone. Woodworkers sometimes buy these exotic walnuts with the idea they will receive something much more highly figured and more beautiful than our own walnut, when, as a matter of fact, unless a lighter color is desired, the American black walnut is probably the most beautiful in all the world and is so recognized internationally.

Limited amounts of walnut veneer, known in the trade as claro walnut, have in the past originated from northern California. The trees were Juglans regia, and were thought to have grown from nuts planted by early settlers.

SOUTH AMERICAN WALNUT

Genus: JUGLANS. Principal lumber species: *neotropica*. (Note: There are possibly 50 species of Juglans altogether. Most are of no commercial importance, but Juglans olanchana of northern Central America, and Juglans australis of Argentina supply some walnut lumber.)

Walnut wood is so widely known and so universally admired that many other woods are commonly finished in imitation of it. For this reason, a complete description of South American walnut should not be necessary, because it is just as legitimately walnut as that produced from our Juglans nigra.

Nevertheless, there are differences worth mentioning, probably the result of different geographical origins. South American walnut grows closer to the equator, and it displays some of the characteristics common to tropical woods. For example, grain and texture are somewhat coarser, open pores are larger and the wood is more absorptive.

Color of South American walnut heartwood tends to be darker while the wood also tends to be lighter in weight. Working and finishing qualities are similar. Unlike North American walnut, the South American varieties are notoriously difficult to kiln dry, giving up their moisture seemingly with great reluctance.

Summing up, South American walnut cannot be equated in value with Juglans nigra, but with our native species ever scarcer and costlier, it is a welcome addition to the roster of ranking decorative woods.

WILLOW

Genus: SALIX. Principal lumber species: *nigra*.

GENERAL CHARACTERISTICS: One of the softest of American hardwoods, resembling basswood in this one respect. Very easy to work. Machines well although inclined to saw a little fuzzy. Stains well, especially to simulate walnut. Tree is deciduous; wood diffuse porous. Color of heartwood varies greatly, from light gray to dark brown or dark reddish brown, sometimes with purplish cast reminiscent of walnut. Sapwood nearly white with grayish cast, to light tan. One of the easiest of all woods to glue. Texture fairly uniform but a trifle coarse; close-grained.

There are many species of willows in the United States, but only one, Salix nigra, or black willow, produces trees of saw timber size. It attains its best development in the rich bottomlands of the lower Ohio and Mississippi Valleys, but is found to some extent all over the eastern half of our country. It is strictly a water-loving species. The tree grows very rapidly, reaching maximum size of 130 feet and diameter of three feet.

Until recently the principal uses of willow lumber have been as plywood core stock, crates, boxes, slack cooperage, excelsior and charcoal. It is now employed in a great many more useful ways, such as inexpensive furniture lines, various planing mill products, toys, beekeepers' supplies, wall paneling, etc.

In the past few years, willow has come into prominence in the industrial arts field in the mid-west, especially for elementary work. It is easy for beginning students to handle, is inexpensive and presents a handsome appearance if some care is exercised in finishing. Perhaps the most pleasing way to finish the wood is by staining it to simulate walnut. It looks astonishingly like the more expensive wood if this is carefully done. Some beautiful effects can be obtained with natural finishes, but care is needed in selecting stock for the individual project, due to the great variation of color common to willow.

ZEBRAWOOD

Species of BRACHYSTEGIA.

Also called zebrano (if from Nigeria, West Africa), and zingana (if from Gabon and the Cameroons). The wood is highly decorative, light gold in color, with narrow streaks of dark brown to almost black, made visible by quartering. It is easy to see why the wood has its common name. It is heavy and hard, and can be polished to high luster, but is rather coarse in texture.

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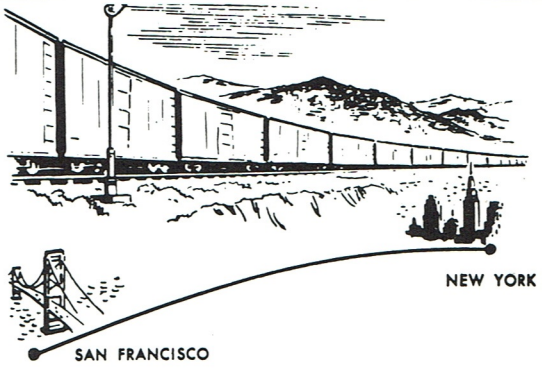

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Special Note: The Hardwood Plywood Manufacturers Association publishes a number of booklets and pamphlets which would be useful to those with a special interest in this product. A list of these publications can be obtained by writing to the Association.

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1619 Massachusetts Avenue, N.W., Washington, D.C. 20036

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Denver, Colorado 80216
Phone: (303) 399-6810
Woodworkers' lumber and plywood. Roof truss and construction component factories.

PAXTON/PATTERSON
5719 West 65th Street
Chicago, Illinois 60638
Phone: (312) 594-7270
School shop equipment and supplies. Complete industrial arts and vocational education service.

FRANK PAXTON LUMBER COMPANY
205 S.W. 11th Street
Des Moines, Iowa 50303
Phone: (515) 283-2131
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FRANK PAXTON LUMBER COMPANY
2900 Bryan Avenue
Fort Worth, Texas 76101
Phone: (817) 924-2225
Woodworkers' lumber and plywood. Wholesale sales department.

FRANK PAXTON LUMBER COMPANY
6311 St. John Avenue
Kansas City, Missouri 64123
Phone: (816) 483-7000
Woodworkers' lumber and plywood. Wholesale sales department.

THE LIETZ COMPANY
1645 East Del Amo Blvd.
Carson, California 90746
Phone: (213) 537-0410

835 Industrial Hwy.
Cinnaminson, N.J. 08077
Phone: (609) 786-0400

Nationwide service for surveyors. Instruments, accessories, equipment and related supplies. Instrument repair and maintenance. Headquarters at Carson.

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PAXTON/PATTERSON
45 Samworth Road
Clifton, New Jersey 07012
Phone: (201) 471-0400
Sales, order processing and customer relations service for Paxton/Patterson customers in the eastern states.

FRANK PAXTON LUMBER COMPANY
P. O. Box 10172
Dallas, Texas 75207
Phone: (817) 261-5519
Sales and customer service for Frank Paxton Lumber Co. of Ft. Worth.

THE LIETZ COMPANY
829 Cowan Road
Burlingame, California 94010
Phone: (415) 697-6365
Sales and instrument repair service for Lietz of Carson, California.

FRANK PAXTON COMPANY
Import-Export Division

6311 St. John Avenue
Kansas City, Missouri 64123

Phone: (816) 483-7000 Cable Name "PAXCO"
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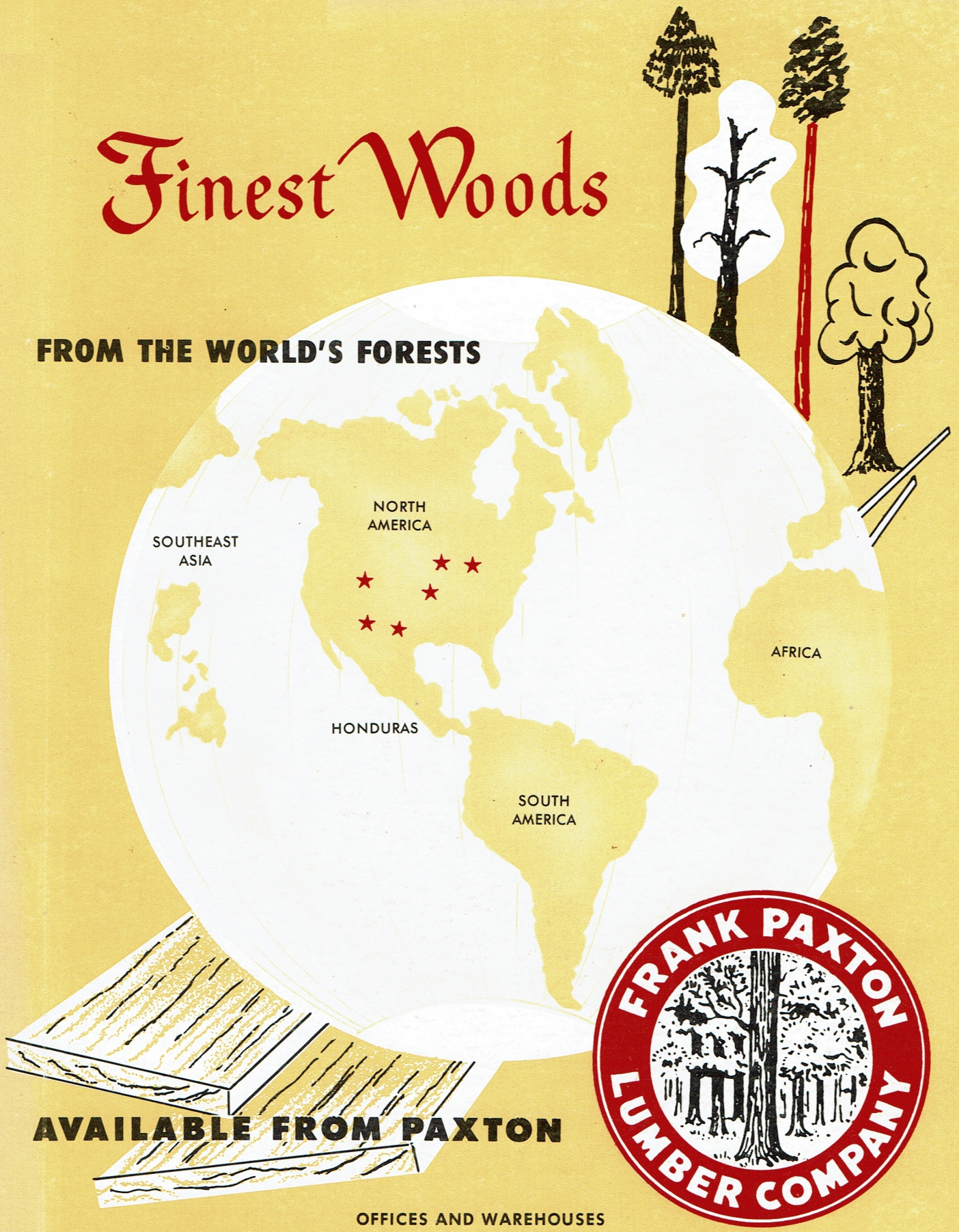

AVAILABLE FROM PAXTON

FRANK PAXTON LUMBER COMPANY

OFFICES AND WAREHOUSES

(Complete addresses are on inside back cover)

KANSAS CITY, MISSOURI 64123
CHICAGO, ILLINOIS 60638
DES MOINES, IOWA 50303
ALBUQUERQUE, NEW MEXICO 87125
DENVER, COLORADO 80216
FORT WORTH, TEXAS 76101